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# Contents of Volume 4

# Съдържание на том 4

DP/71/2009

# Testing the Weak-form Efficiency of the Bulgarian Stock Market

Nikolay Angelov

Abstract. In this paper we test for the presence of weak-form efficiency in the Bulgarian stock market. Employing daily and weekly data for individual securities traded on the Bulgarian Stock Exchange, two artificial portfolios and the market index SOFIX, we apply statistical tests based on the estimated autocorrelation functions and the variances of the stock prices sampled at different frequencies. The random walk with drift model is not well supported over the entire sample period (October 2000 – November 2006). Furthermore and contrary to our initial expectations, the Bulgarian stock market is found closer to being efficient in the first sub-period of the sample (October 2000 – October 2003) than in the second one (October 2003 – November 2006). This suggests that no convergence towards weak-form efficiency occurred over the examined period, despite the increase in the number of listed securities, market capitalization and investors' interest. Additional evidence, coming from a comparison of the returns from trading based on filter rules and those from following a simple buy-and-hold approach, demonstrates that even if there are some inefficiencies present in the market, it is not so easy to convert them into abnormal profits.

Резюме. В това изследване се тества наличието на слаба степен на ефективност на българския фондов пазар. Въз основа на дневни и седмични данни по ценни книжа, търгувани на Българската фондова борса, два фиктивни портфейла и пазарния индекс СОФИКС, се използва статистически тест, основан на оценени функции на автокорелация и вариации на извадка на борсовите цени с различна честота. Случайното блуждаене при дрейфов модел не намира достатъчно потвърждение през целия период на извадката (октомври 2000 г. – ноември 2006 г.). Освен това и обратно на първоначалните ни очаквания българският фондов пазар бе по-ефективен през първия подпериод на извадката (октомври 2000 г. – октомври 2003 г.), отколкото през втория (октомври 2003 г. – ноември 2006 г.). Това показва, че липсва конвергенция спрямо слабата степен на ефективност, проявила се през разглеждания период, въпреки увеличения брой листвани ценни книжа, пазарната капитализация и интереса на инвеститорите. Допълнително доказателство, получено при съпоставяне на възвръщаемостта на търговията въз основа на правилата за подбор и на тези, произтичащи от една обикновена стратегия на дългосрочно инвестиране, показва, че дори ако на пазара е налице известна неефективност, не е толкова лесно тя да бъде превърната в свръхпечалба.

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## Contents

## 1. Introduction

The development of capital markets in transition and emerging market economies is a very important prerequisite for fostering their growth as it allows the available funds to be channeled easily to their best investment uses. An important question, in this respect, is how quickly the markets for capital in transition countries like Bulgaria can reach the stage of efficient functioning, so that the economies can fully benefit from their operation. There are several different dimensions to the concept of market efficiency. In this paper, we are going to focus on the one that concerns the asset price formation mechanism.

Market efficiency is a concept intimately related to the diffusion of information. More specifically, it concerns the mechanism according to which asset prices react to news and the speed with which the adjustment takes place. In a perfectly efficient market, the arrival of news should cause an instantaneous and full adjustment of the asset prices to their new *fair* values. In other words, the incorporation of the incoming information is so fast and accurate that no one is able to achieve abnormal profits by trading on the news flowing to the market. In such an environment, investors can not predict the future price movements and, therefore, should only expect to obtain a normal rate of return, corresponding to the risk profile of their portfolios.

The idea of market efficiency, defined above, differs in meaning from the concept of allocational efficiency also frequently attributed to the markets. The latter refers to the way scarce resources are distributed among competing uses and affects the overall increase in social welfare, resulting from the operation of the markets and the exchange among economic agents that takes place in them. The former, on the other hand, deals with the fairness of the asset prices at any point in time and the availability of profit opportunities stemming from improper price formation mechanisms.[1]

Why is the presence of market efficiency so important in reality? There are both theoretical and practical reasons for that. From theoretical point of view, the efficient markets hypothesis provides some of the assumptions upon which most of the asset pricing models are built. These include the "no arbitrage" argument and the random walk processes for the evolution of the prices of the underlying assets, conjectured by some derivatives pricing models. If, in reality, it turns out that markets are not efficient, then finance professionals will not be able to rely on the correctness of the asset prices derived from such models. Furthermore, new pricing models would have to

[1] Henceforth, when we say market efficiency we will refer to the aspect of it related to the asset price formation mechanism.

be developed to take into account the specific sort of inefficiency present in the financial market under investigation. From practical point of view, the violation of the market efficiency might imply the availability of (almost) riskless profit opportunities. They can be seized by devising a proper trading strategy which extracts signals from the incoming news to determine the right moment to buy/sell assets on the inefficient market.

In this paper, we focus on studying the efficiency of the Bulgarian capital market by using data for securities traded on the Bulgarian Stock Exchange. We look at the period from October 2000 to November 2006, when the market had in place already sufficient regulations and infrastructure to facilitate the trading activity. By choosing this period, we also aim to fill in the existing gap in the literature on the Bulgarian capital market and provide an opportunity for comparison with similar studies conducted for other transition economies.

We found Bulgarian Stock market to be an interesting object of investigation, because of two peculiarities it has: 1) it is quite young[2] and 2) it is rather small[3] in terms of both market capitalization and trading volumes. The relatively infant development stage of the Bulgarian Stock Exchange implies that the market microstructure may not have been built yet to a level sufficient to support the efficient price formation mechanism. This issue concerns both the way in which information is released to the market participants, and the way in which the trading activity is structured. The latter is crucial for the ability of the investors to react to news in their quest for abnormal returns. For example, as of the time of this writing, there was no possibility for short sales of stocks. If present, such opportunities would potentially allow market participants to take advantage of the incorrectly priced assets, to arbitrage away the price inconsistencies and thus to restore the equilibrium in the market.

The small size of the market implies that the frequency of trading with certain stocks may be relatively low and/or the traded volume too small. This may create substantial liquidity risks for those market participants who try to put in place trading strategies, based on technical or fundamental analysis. If such risks are present, the market may turn out to function in an inefficient way, because even if someone tries to take advantage of the presence of pricing inconsistencies he/she may not be able to do so, because of the low liquidity in the market.

[2]The trading of shares in Bulgaria after the collapse of the centrally planned economy started in the first-half of the 1990s. In its current form the stock market operates since late 1997.

[3]The total market capitalization of the various segments of the Bulgarian Stock Exchange as of March 2007 was about BGN 18.5 billion (EUR 9.5 billion).

These peculiar features of the Bulgarian Stock Market make the investigation of its efficiency quite an interesting and at the same time tricky endeavor. This is why we approach the issue cautiously and from two different angles. On the one hand, we apply statistical tests based on the estimated autocorrelation functions and the variances of the stock prices sampled at different frequencies, in order to test the validity of the random walk model of the evolution of asset prices. On the other hand, we attempt to establish the usefulness of some trading strategies in the quest for abnormal returns. This dual approach allows us to draw conclusions not only on the correctness of the efficient markets assumption in asset pricing models, but also on the possibility of market professionals to take advantage of market inefficiencies, should they be present.

The rest of the paper is structured as follows. Part 2 reviews the literature on financial market efficiency and presents some of the evidence for other transition economies. Part 3 describes the methodology employed in the paper and discusses the estimation procedures, while Part 4 explains the construction of the data set. Then, Part 5 presents in detail our empirical results and their implications for the validity of the efficient markets hypothesis. Finally, Part 6 concludes the discussion.

## 2. Literature Review

Undoubtedly, the efficiency of the capital markets is one of the most explored topics in the financial economics literature. Some of the earliest studies date back to the 1930s, with the main empirical contributions coming in the 1960s and 1970s (for a thorough review see, for example, Fama (1970) and (1991). As our interest in this paper is focused on a specific country – Bulgaria – we are only going to review the papers that provide the relevant statistical methodology and to summarize the empirical evidence for several other countries in Central and Eastern Europe.

Campbell, Lo and MacKinlay (1997) provide an excellent overview of the various approaches to testing market efficiency under different hypotheses for the evolution of the asset prices. They present empirical evidence for the (un)predictability of the asset returns at various frequencies, including not only tests with daily and weekly data, but also an investigation on the long-range dependence. We borrow their classification of random walks and employ the variance ratio tests defined in one of their earlier papers (Lo and MacKinlay (1988). For testing the profitability of trading strategies, based on technical analysis, we follow the approach of Fama and Blume (1966), which specifies a filter trading rule and compares its returns to those generated by a simple buy-and-hold strategy.

When it comes to studying the efficiency of the capital markets in our region of interest – Central and Eastern Europe – we should say that the literature is not so abundant, at least in terms of geographical coverage. Studies are available mainly on Russia and the three Baltic states (Lithuania, Latvia and Estonia). Yet, the variety of research methods used is quite wide, so we deem it worthwhile to review some of the good examples in the field.

Kvedras and Basdevant (2004) study the evolution of the capital markets in the Baltic states in the period from mid 1996 till late 2001. Seeking to establish the convergence towards market efficiency, the authors devise a time-varying version of the variance ratio test statistic, defined by Lo and MacKinlay (1988) and employ a Kalman filter model to estimate time-varying autocorrelation coefficients for the stock market indices of the three Baltic states. Using daily data on the indices LITIN (Lithuania), DJRSE (Latvia) and TALSE (Estonia) the authors find that the Lithuanian and Estonian stock markets exhibit pronounced trends towards market efficiency, while Latvia shows no clear pattern over the period.

The conclusions of Kvedaras and Basdevant (2004) are broadly supported by the findings of Mihailov and Linowski (2002). Instead of relying on statistical tests, however, they employ several trading rules based on technical analysis and estimate the relevant parameters (buy/sell indicators) using genetic algorithms. The results of such trading strategies are then compared to those of a simple buy-and-hold investment approach. Their sample consists of daily data on the RICI index (Riga Stock Exchange price index) and spans the period from November 1997 to January 2001. Using a variety of trading windows and other calibration parameters, the authors find evidence that trading strategies based on technical indicators can outperform the buy-and-hold strategy in a bearish market at low to moderate levels of transaction costs. However, the investment approach tested can not say which technical indicator should be used to consistently outperform the buy-and-hold rule, i.e. no adjustment for the ex-ante model risk is made in the comparison.

Moving to the evidence about Russia, we begin with a review of the findings of Abrosimova, Dissanaike and Linowski (2002). They employ classic statistical tests to assess the predictability of the RTS (Russian Trading System) Index returns at daily, weekly and monthly frequencies, hypothesizing a random walk with drift model. For the sample period from September 1995 till May 2001, the authors find some evidence of predictability of the daily and weekly returns. Yet, they conclude that the patterns unveiled are unlikely to allow the investors to devise a trading rule that consistently outperforms the market.

Hall and Urga (2002) devise a test for changing market efficiency based on time varying parameter model with GARCH–M structure of the residuals.

The sample features data on the two main indices of the Russian stock market – RTS and ASPGEN – for the period September 1995 to March 2000. The estimates obtained using Kalman filter technique reveal that the index of the most liquid Russian stocks (RTS) exhibits initial inefficiency patterns, but then in the course of a period of 2.5 years moves close to the state of efficiency. The results with the broader index ASPGEN demonstrate that the overall performance of the market remained predictable for most of the time and only towards the end of the period showed signs of improving efficiency.

The only paper studying the stock market efficiency in Bulgaria, of which we are aware, is Emerson, Hall and Zalewska–Mitura (1997). The authors employ a multi-factor model with time-varying coefficients and GARCH errors on a sample of weekly data for four shares covering the period between the first week of 1994 and the first week of 1996. In this early period of development of the Bulgarian stock market, the evidence obtained from their Kalman filter estimates suggests that the market undergoes three phases of development. In the first one, there are no clear signs of initial inefficiency just because the trading is very thin and very little information is available. In the second phase, when the market volumes increase, patterns of inefficiency appear and then get quickly reduced during the third phase. Our paper aims to provide further evidence about Bulgaria, by examining the efficiency of the Bulgarian stock market in a later stage of its development, when new legislation governs the trading and more securities and investors are present in the market.

## 3. Methodology

Any procedure for testing the efficiency of a given financial market requires two prerequisites: 1) specification of the information set, with respect to which the efficient functioning of the market will be tested; and 2) specification of a model for the evolution of the asset prices under the efficient markets hypothesis. For the purposes of our study we define these two as follows. We consider the information set that includes only the history of asset prices or the corresponding returns, i.e. we aim to examine the weak-form *efficiency*[4] of the Bulgarian stock market. We conjecture that if the market is efficient the asset prices should evolve according to the random walk with drift model, specified in Eq. (1):

[4] There are two other frequently mentioned information sets when it comes to testing market efficiency: 1) the set of all relevant *publicly* available information, which relates to the *Semi-strong form efficiency* of the financial markets; and 2) the set of all information known to *any* market partici pant, which relates to the *Strong form* of the efficient markets hypothesis.

$$p_t = \mu + p_{t-1} + \varepsilon_t \quad (1)$$

Where:

$p_{t-1}$ – is the natural logarithm of the last observed price of the asset, sampled at daily, weekly, or other appropriate frequency;[5]

μ – is the drift term, which essentially measures the expected rate of return on the asset between time *t-1* and *t*;

$\varepsilon_t$ – is a stochastic disturbance term, which incorporates the influence on the asset price of news arriving between time t-1 and t.

Depending on the specification of the stochastic term $\varepsilon_t$ we distinguish three types of random walk, defined as follows:[6]

– *Random Walk 1 (RW1):* $\varepsilon_t \sim$ IID $(0, \sigma^2)$. This type of random walk features disturbance terms that are independently and identically distributed (IID). This assumption is very conservative when it comes to financial markets with very long history and many changes in the economic and institutional environment. Yet, for recently established stock markets like the Bulgarian one, it may not be completely implausible and hence is worth testing. This is why we devote some attention to it;

– *Random Walk 2 (RW2):* $\varepsilon_t \sim$ INID (independently and not identically distributed disturbance terms). Here the assumption of identically distributed disturbances of the RW1 model is relaxed to allow for a more general evolution of the asset prices, featuring changing volatility or even different underlying distributions from which $\varepsilon_t$ is drawn at different dates. In general, testing for the validity of this model is very difficult due to the large number of processes that could fall under the null hypothesis. This is why, we do not attempt to test for RW2 in our paper and list it here only for completeness;

– *Random Walk 3 (RW3):* $\text{cov}(\varepsilon_{t'}, \varepsilon_{t-k}) = 0$, for all $k \neq 0$. This is the most general version of the random walk process, in which even the independence assumption is relaxed to the extent that the disturbances $\varepsilon_t$ are required only to be uncorrelated, i.e. linearly independent. Yet, this type of random walk does not exclude the possibility of correlation between non-linear functions of $\varepsilon_{t'}$ and $\varepsilon_{t-k}$.

Having specified the setup under which we are going to test the efficiency of the Bulgarian stock market, we proceed by examining the test procedures that we employ. In our attempt to provide evidence from several

[5] Random walk processes are not usually specified in the natural logarithm of the variable, rather in the variable itself. In this case, the natural logarithm is necessary to avoid the small yet existing probability to observe negative asset prices when the support of the underlying distribution of $\varepsilon_t$ is defined from $-\infty$ to $+\infty$.

[6] For a more detailed description see Campbell, J.Y., A.W. Lo and A. C. MacKinley, The Econometrics of Financial Markets, 1997, Princeton University Press, pp. 31–33, whose classification we borrow here.

different viewpoints, we take two different routes. The first one encompasses a battery of statistical tests for the validity of the random walk models defined above. The two relevant types of testing procedure that we put to use here are: 1) autocorrelation functions[7] together with tests based on them (e.g. Box–Pierce Portmanteau test), and 2) variance ratio tests. The second route we take is more practical as it tries to find ways for realizing superior returns by following certain trading strategies. We do so by employing filter rules to test whether one can obtain returns better than those of a simple buy-and-hold strategy.

The two groups of testing approaches outlined above are very different in nature. The tests based on autocorrelations and variance ratios have the random walk model as their null hypothesis. Consequently, if these tests fail to reject the null hypothesis, they will provide direct evidence for the correctness of the random walk assumption for the evolution of the asset prices. Unlike that, the filter rules are deviced with the underlying conjecture that the asset prices evolve according to a complicated non-linear model, i.e. the null hypothesis is that the market is not efficient. Hence, if this trading approach fails to provide superior returns, this will not necessarily imply that the market is efficient, rather that this specific null hypothesis is not supported by the data.

Clearly, using these two groups of tests in conjunction will allow us to gain better insight into the nature of the process underlying the evolution of the stock prices and to draw better implications for trading. We examine the mechanics behind the variance ratios and the filter rules below.

### *3.1. Variance Ratios*

Under the random walk hypotheses, which we conjectured for the evolution of the securities prices, the variance of the continuously compounded asset returns should grow linearly with time. This means that the variance of the asset returns estimated over n-period intervals should be equal to n-times the variance of the 1-period asset returns. On the basis of this observation, Lo and MacKinlay (1998) define the following general variance ratio:

$$VR(q) \equiv \frac{Var[r_t(q)]}{q.Var[r_t]} = 1 + 2\sum_{k=1}^{q-1}(1-\frac{k}{q})\rho(k) \qquad (2)$$

[7] The methodology for the calculation of autocovariances is described in Appendix 3.

Where: $r_t(k) \equiv r_t + r_{t-1} + ... + r_{t-k+1}$

$\rho(k)$ – is the k-th order autocorrelation coefficient of the sequence of returns $\{r_t\}$;

The formula shows that the variance ratio is a linear function of the first *q-1* autocorrelations of the sequence of returns $\{r_t\}$. Hence, if the returns of a particular asset are not autocorrelated, as implied by the random walk model, the variance ratio should have a value of 1. Campbell, Lo and MacKinlay (1997) specify the ways to estimate the variance ratios under the RW1 and RW3 null hypotheses and present the corresponding test statistics, which we borrow for the purposes of the present study.[8]

### *3.2. Filter rules*

In order to test the presence of weak-form market efficiency in the Bulgarian Stock Exchange from a practical perspective, we employ the *x* per cent filter rule of Sydney S. Alexander.[9] He devised his data filtering approach starting from the assumption that stock prices may adjust only gradually to news arriving to the market.

> The professional analysts operate in the belief that there exist certain trend generating facts, knowable today, that will guide a speculator to profit if only he can read them correctly. These facts are assumed to generate trends rather than instantaneous jumps because most of those trading in speculative markets have imperfect knowledge of these facts, and the future trend of price will result from a gradual spread of awareness of these facts throughout the market [Alexander (1961), p. 7].

The *x* per cent filter rule of Alexander is defined as follows: "If the daily closing price of a particular security moves up at least *x* per cent, buy and hold the security until its price moves down at least *x* per cent from a subsequent high, at which time simultaneously sell and go short. The short position is maintained until the daily closing price rises at least x percent above a subsequent low, at which time one covers and buys. Moves less than *x* per cent in either direction are ignored" (Fama and Blume (1966), pp. 227–228). In simpler words, the idea of Alexander is to filter the trends (price movements exceeding the filter value) from the noise (price movements not exceeding the filter value), believing that once a trend appears it will be present for a while, before prices settle or start to move in the opposite direction. If such filter is to work, there must be certain degree of persistence (positive dependence) in the stock price movements, instead of the independence implied by the random walk model.

[8] The test statistics were originally defined by Lo and MacKinlay (1988). The formulas and sampling distributions are summarized in Appendix 2.

[9] See Alexander (1961) and Alexander (1964).

In this paper, we use the *x* per cent filter rule calculations as described in Fama and Blume (1966). We employ 24 different filter values, which allows us to figure out what is the dependence of the filter performance on the value of the filter. The readers interested in the mechanics of the calculations and the relevant formulas should refer to that paper (pp. 232–233).

## 4. Data description

The recent history of the capital market in Bulgaria began in 1991, shortly after the democratic reforms. Initially the market was quite chaotic, with no prompt regulations in place and very few traded securities. In its current version, the Bulgarian Stock Exchange was launched in October 1997 with two sub-markets – official and unofficial one. The first companies to be listed were those that were mass-privatized. Later to them were added also the mass privatization funds, after they have been converted into holding companies.

For the purpose of testing the efficiency of the Bulgarian capital market, we use a sample containing individual stocks traded on the Bulgarian Stock Exchange, two portfolios made up of these stocks with different weights and the market index SOFIX. The latter was introduced on October 20, 2000 with base value of 100 and during most of its existence included 12 to 14 securities weighted by their market capitalization and meeting certain requirements about market capitalization, free float, minimum number of investors, as well as frequency and volume of trading.[10]

All the data used in the present study were downloaded from the data base of the Bulgarian Stock Exchange, freely accessible through its web-site. The time series stored there were adjusted for dividend payments, splits and dilution after capital increases. On the one hand, this adjustment of the data facilitates better estimation of test statistics, as it helps us to capture better the underlying price evolution process. On the other hand, it limits the quality of the inference as it does not allow proper evaluation of the performance of trading rules based on actually observed prices.

Despite the fact that data were available for the period since the beginning of 1998, we decided to use a sample spanning the period from October 20, 2000 to November 23, 2006. The initial date of the sample was chosen to coincide with the introduction of SOFIX, in order to make our results internally consistent[11] and at the same time to keep them comparable

[10] For more details about the calculation of Sofix, the criteria for inclusion of companies and its current members please refer to the web-site of the Bulgarian Stock Exchange at: www.bse-sofia.bg

[11] By internally consistent, we mean results that are based on the same sample period for the individual stocks and the market index.

to those of other studies that use only market indices. In addition to that, by selecting a later starting date, we tried to alleviate the influence of two problems peculiar to stock markets in the early stages of their existence: low trading volumes and infrequent trading. The first one is, anyway, impossible to tackle, while the second one can be somehow overcome. Unfortunately, it was not possible to get completely rid of these two market phenomena and still have long and wide enough sample.

While selecting our sample, we took two steps to alleviate the influence of the infrequent trading problem: 1) carefully selecting only stocks that are traded frequently enough (with as few missing values as possible); 2) using two alternative methodologies to impute missing values and then studied the sensitivity of the estimation results to the imputation method used. Another alternative was to employ a statistical data correction approach like the one suggested, in Miller, Muthuswamy, and Whaley (1994). To correct for the effects of thin trading, they suggest the estimation of a moving average model that reflects the number of non-trading days and then adjusting the returns accordingly. However, given the difficulties in identifying the non-trading days, Miller, et al. showed that an equivalent approach is to estimate an AR(1) model of the form:

$$r_t = a_1 + a_2 r_{t-1} + \varepsilon_t$$

and then calculating the adjusted returns using the following formula:

$$r_t^{adj} = \frac{\hat{\varepsilon}}{(1-a_2)}$$

We decided not to correct our data using such an approach, in order to ensure that the results from the test statistics that we estimate are comparable to those obtained from the filter rule techniques, which require the estimation to be performed with the actually observed data.

In order to get better understanding of how the market efficiency evolved over time, we defined two sub-periods in our time series sample. The first one includes the observations taken between Octover 20, 2000 and October 20, 2003, a period characterized with both bullish and bearish phases. The second period spans the rest of the sample (observations taken between October 21, 2003 and November 23, 2006) and is characterized by pronounced upward trend and annual growth rates in excess of 40 percent. This devision of the sample into sub-periods is quite arbitrary, with the main idea being to consider time horizons of roughly equal length. We calculated all test statistics for both the whole period and for each of its two sub-periods.

After performing our sample selection procedure, we were left with time series for the prices of 11 individual stocks and the values of the market index

SOFIX.[12] We calculated the continuously compounded returns at daily and weekly frequency for each of these 12 price series. In addition to that, we constructed two portfolios: one that has initial weights based on the market cap of the 11 stocks in the beginning of the sample period (October 23, 2000) and another one with equal initial weights. With these 14 time series we performed all the calculations described in the following section.

## 5. Estimation results

### *5.1. Autocorrelation function analysis with daily and weekly data*

We begin with an analysis of the estimated autocorrelation functions and the corresponding Box – Pierce Q-statistics for daily and weekly stock returns for our set of 11 individual stocks, one stock market index and two portfolios.[13] Table 1 presents the estimates with daily data for the whole sample period October 20, 2000 – November 23, 2006, together with results for its two sub-periods. The reported first-order autocorrelation coefficients $\rho(1)$ for SOFIX, the equally-weighted and the market capitalization weighted portfolios, over the whole period are –9.1 per cent, 12.8 per cent and 5.2 per cent, respectively. Under the RW1 hypothesis, the asymptotic distribution of $\rho(1)$ is normal with mean 0 and standard deviation $1/\sqrt{T}$, which for a sample of 1525 observations implies a standard error of the estimates of 2.56 per cent. This means that at the 95 per cent confidence level, we have statistically significant estimates of non-zero autocorrelations for SOFIX and the equally-weighted portfolio, with the market capitalization weighted portfolio being on the margin. For the individual stocks the results are a bit more in favour of the efficient markets hypothesis, with only two first order autocorrelations out of eleven, exceeding in absolute value the level of 7.5 per cent. Three more interesting findings are worth noting: 1) 6 out of the 14 time series exhibit sign reversals, i.e. the sign of $\rho(1)$ in the first sub-period differs from the one in the second sub-period; 2) in 9 of the 14 cases, $\rho(1)$ for the second sub-period exceeds the one for the first sub-period, which suggests that there is no movement towards market efficiency; 3) it is not uncommon for the time-series to exhibit significant higher-order autocorrelations. The latter finding is supported by the values of the Box – Pierce Q-statistics. For 11 of the 14 series, the test statistics with 4, 8 and 12 autocorrelations estimated over the

[12] For complete description of the sample selection process we used please refer to Appendix 2.
[13] A summary of the results analyzed in this section is presented in Table 7.

whole sample period are statistically significant at the 5 per cent level.

Moving to the estimates with weekly data (see Table 2), we observe that the first-order autocorrelations for SOFIX, the equally-weighted and the market capitalization weighted portfolios stand at – 8.6 per cent, 20.9 per cent and 10.0 per cent respectively. The relevant standard error of the estimates that we need to use here for a sample of 307 observations is 5.71 per cent, which means that only one of these three autocorrelations is significantly different from zero. Out of the 11 individual stocks, we have 5 with $\rho(1)$ exceeding 10 per cent and 6 with sign reversals in the second sub-period as compared to the first one. The Q-statistic estimated with 4 autocorrelations over the whole sample period is statistically significant in only 5 of the cases versus 11 with daily data, but when the number of autocorrelations is increased to 8 and 12, we have respectively 8 and 10 cases with significant Box–Pierce statistic. This last finding suggests the presence of significant higher-order autocorrelations in some of the time series, which is not in-line with the efficient markets hypothesis. Further support for such a conclusion comes from the observation that there are at least 4 individual securities (ALBHL, PET, AFH and ALB), for which $\rho(1)$ is large and positive (negative) in the first sub-period, large and negative (positive) in the second sub-period, but very close to 0 over the whole sample period. Such patterns indicate that the autocorrelations functions are quite unstable over time and that the inference is sensitive to the period under consideration. In order to examine these findings in more detail, we continue with the variance ratio tests under RW1 and RW3 null hypotheses.

### *5.2. Variance ratio tests with daily and weekly data*

The variance ratios estimated under the RW1 hypothesis with daily data, and with 2, 4, 8, 12 and 16 autocorrelations are presented in Table 3. Over the whole period, SOFIX tends to reject the null hypothesis only for the version of the variance ratio with 2 and 4 autocorrelations. The value of the ratio is below 1, which is due to the presence of negative first and third order serial correlation. On the other hand, the two portfolios in our sample exhibit variance ratio values of above 1, with those for the equally–weighted portfolio consistently higher than those for the market capitalization weighted portfolio. In both cases, however, the RW1 hypothesis is rejected. When it comes to the individual stocks, there is only 1 security (SFARM), which consistently exhibits behavior in line with the RW1 model. For the other securities, we observe mixed patterns across sub-periods and number of autocorrelations, included in the test statistic. For the whole sample, the

variance ratios are significantly different from 1 in 6 to 8 of the 14 time series, depending on the number of the autocorrelations used in estimating the test statistic.

The results for the same version of the variance ratio, but with weekly data shed slightly different light on the validity of the RW1 model in the Bulgarian Stock market (see Table 4). The estimates for SOFIX fail to reject the null hypothesis even in a single occasion, although the values of the variance ratios vary substantially across the sub-periods of our sample. As in the case with daily data, the null hypothesis is consistently rejected for the two portfolios, especially when more autocorrelations are used in the estimation. Overall, the RW1 is not supported in 4 to 7 of the 14 time series we study, which is less than the case with daily data. One more fact is worth noting: the variance ratios tend to be significantly different from 1 more often in the second sub-period than in the first one. This finding runs contrary to the conjecture that as the Bulgarian stock market gets more developed it should come closer to being weak form efficient. Let's not forget, however, that the RW1 model is quite restrictive and hence less likely to be supported by the data coming from a young and small market, like the Bulgarian one. This is why, we need to examine and put more emphasis on the evidence coming from the variance ratios computed under the RW3 null hypothesis. We analyze these in turn.[14]

With daily data, the variance ratio estimates for SOFIX under the RW3 model exhibit quite a peculiar pattern (see Table 5). The values of the ratio in the first sub-period are strictly below 0.9 and the null hypothesis is never rejected. When we consider the second sub-period, however, we find variance ratio values of above 1.2, with the RW3 model rejected in all of the cases (with 2, 4, 8, 12 and 16 autocorrelations). Even more interestingly, for the whole sample period the values of the ratio gravitate around 0.9 and again, as in the first sub-period, the RW3 model is not rejected even in a single occasion. The two portfolios in our sample exhibit a very different behavior. The values of the variance ratio for them is consistently above 1 across sub-periods and number of included autocorrelations and the null hypothesis is rejected in almost all cases, except for those with 2 autocorrelations for the market capitalization weighed portfolio. When it comes to the individual securities, the null hypothesis is rejected less often than in the case of the RW1 model. Furthermore, there are at least six securities (ALB, GAMZA, AFH, PET, SFARM and IHLBL), which clearly exhibit

[14] A summary of the results analyzed in this section is presented in Table 8.

behavior entirely in line with the RW3 hypothesis. Over the whole sample period, the weak-form market efficiency hypothesis is not confirmed in 3 to 6 of the 14 time series (depending on the number of autocorrelations used in the test statistic), however, we observe again that in the early period of our sample, the RW3 model is rejected considerably less often in the later period.

Moving on to the weekly data (see Table 6), we find similar patterns with certain qualifications, which we will address. SOFIX again exhibits different behavior in the earlier sub-period relative to the later one, but unlike the case with daily data, this time the RW3 model is not rejected even in a single occasion. The equally-weighted portfolio again runs contrary to the weak-form efficient behavior, while the market capitalization weighted portfolio frequently tends not to reject the null hypothesis when the variance ratios are estimated with smaller number of autocorrelations. The individual securities tend to lend strong support to the weak-form efficient price formation mechanism, especially in the period from late 2000 to late 2003, when there is not even a single security that rejects the RW3 model.

It is really challenging to provide a good explanation for this result. Conceivably, part of it may be attributed to the imputation of a lot of missing values in the first sub-period with the resulting modification on the true, yet unobserved price formation process. Indeed when we compare the results for the two different methods that we use for imputing missing values, we find that the results are mostly sensitive in the first part of our sample. Even taking that into account, however, the RW model is still rejected more frequently in the second sub-period. So, there must be other factors at play.

Lastly and before we go to the filter rules, we need to mention that in Appendix 4 we present the estimates of the autocorrelation functions and variance ratios for daily and weekly returns, obtained using the data set with linear interpolation of the missing values. Without going into details, we should say that our original conjecture that linear interpolation tends to reinforce the autocorrelations was confirmed and therefore we found more often rejection of the efficient markets hypothesis than in the case when we imputed the last observed price to fill in the missing price observations.

### *5.3. Filter rules (x per cent filter)*

In this sub-section, we present a different sort of evidence regarding the validity of the efficient markets hypothesis in the Bulgarian Stock Exchange. We leave the statistical tests aside and try to establish whether one could achieve returns superior to those of a buy-and-hold strategy by using a filter trading rule. For the purpose of carrying our calculations, we use only the sample with daily observations, in which the missing values have been

substituted by the last observed value.[15] We employ twenty-four different filter values, ranging from 0.5 per cent to 50 per cent.[16] For each filter value and security in our sample, we calculate the annualized rate of return that would have been achieved if the filter rule were applied and then compare it to the annualized return over the same period of a buy-and-hold strategy. The results of these estimations under the assumption of zero transaction costs (brokerage fees and fees to the stock exchange) for the period, when the positions were open under the various filter values, are reported in Table 9.

Two conclusions can be easily made from examining the results. First, it is apparent that the filter rule technique had very limited ability to outperform the buy-and-hold strategy throughout our sample period. Out of the 207 cases examined[17] the filter rule approach generated superior returns in only 23. Second and more important from investors' viewpoint, our filter rule tended to generate quite often negative returns and this happened throughout the whole range of filter values. The main reason for such a result is the bullish market during most of the sample period,[18] which made it extremely tricky to realize positive returns on short positions.[19] Another interesting observation is related to the result that there was not a single filter value to clearly dominate all other values. In our case, there were four filter values (0.015, 0.02, 0.07 and 0.14), which generated superior returns for two (out of the eleven) securities. Fifteen filter values generated superior returns for a single security, while the remaining five values completely failed to outperform the buy-and-hold strategy. This finding implies the presence of certain risk for the investors in choosing, which filter value to use if they decide to follow this trading strategy. Of course, it is reasonable to expect (and this conjecture is confirmed by our results) that when transaction costs are taken into account the filter values that provide the highest total return

[15] In this way, we ensure that the imputation of values does not trigger trading under any of the filter rules, i.e. no transaction can take place in a day when there was no actual trading with the particular security.

[16] We use the same filter values as in Fama and Blume (1966) to allow comparability of the results.

[17] In principle the total number of cases is 264 (11 securities x 24 filter values per security), but for some of the high filter values there were no transactions completed and hence no returns could be calculated and compared.

[18] The average annual returns of the market index SOFIX in most of the years in our sample was close to 40 percent.

[19] To provide further support to this conclusion, we need to say that for two of the securities in our sample (SFARM and AFH) and for several filter values, we run into a situation, in which the loss on a single short position exceeded 100 percent (when this happened we could not calculate compounded return for the transaction and concluded that the buy-and-hold strategy is superior).

should lie in the middle range (between 5 and 20 per cent).[20] This is due to the ability of such filter values to ensure that: 1) the first position is entered into early enough; 2) the investor does not need to trade too often and hence can save on transaction costs.

In order to gain further insight, we compare the average returns per security for all filter values, presented in Table 10. The key finding here is that short positions consistently generate negative average annualized returns. This, however, is only simulated evidence as short sales are actually not allowed on the Bulgarian Stock Exchange and hence could not influence the price processes that we actually observed over our sample period. This is why, it is a lot more relevant for us to use the breakdown of returns in Table 10, to figure out whether the filter rule technique provides good signals for entering into long positions. The evidence in this respect is somewhat ambiguous. The average annualized returns from taking long positions for 4 of the securities exceed those from following a buy-and-hold investment strategy and in the cases of ALBHL, PETHL and BHC the difference is rather substantial. For the other 7 securities, however, the opposite situation prevails. Furthermore, the performance of the filter rules differs markedly across individual securities. For example, there are 5 securities in our sample for which none of the 24 filter values yields superior returns to those of a buy-and-hold strategy. On the other hand, 21 of the 23 filter rules, superior to those from the buy-and-hold strategy, pertain to only 3 securities[21] (13 to BHC, 4 to PETHL and 4 to GAMZA). So, it turns out that the filter rules either work superbly for a specific security or do not work at all. This result, obviously, lends evidence neither in favor of the efficient markets hypothesis, nor against it.

Lastly, we examine the average performance for each of our 24 filter values. The upper panel of Table 11 presents the estimation results not corrected for transaction costs, while the lower panel contains results computed under the assumption of 0.5 per cent cost incurred in each transaction. Here, the inability of the filter rule technique to outperform the buy-and-hold approach becomes even more evident. There is only one filter value (0.50) with average return across the 11 securities higher than the

[20] For example, with 0.5 percent transaction costs introduced into the calculations the number of cases in which the filter rule outperforms the buy-and-hold strategy drops from 23 to 9, with 8 of the cases produced by filter values in the range from 0.07 to 0.18.

[21] We tried to figure out whether the performance of the filter rule has anything to do with the number of missing values (i.e. the number of days with non-trading) for each individual security. BHC has, for example, 367 missing values or 24.1 percent of all observations and is the security in our sample with the highest number of missing values. The other two securities, PETHL and GAMZA, are in the opposite extreme with only 18 and 140 missing values, respectively (1.2 percent and 9.2 percent of all observations). Hence, we do not find convincing evidence that relates the frequency of trading to the performance of the trading rules.

respective value for the buy-and-hold approach. This number grows to 5 when we take the average return for the long positions only. Yet, it is worth noting that only half of the filter values produce positive average returns, with none of the filter values being below 0.05. This confirms once more the idea that the best filter values are in the middle range (in this case from 0.07 to 0.16) regardless of whether we take into account the transaction costs.

## 6. Conclusion

In this paper, we tried to examine the degree to which a young and small capital market, the one in Bulgaria, was close to being weak-form efficient during the period from late 2000 to late 2006. Using daily and weekly data for a set of individual securities, a market index and two artificially constructed portfolios, we discovered that standard statistical tests do not entirely support the random walk model for the evolution of stock prices. More specifically, we found significant first and higher order autocorrelations in the asset returns, with the pattern more pronounced for daily than for weekly data. Furthermore, there were several cases of significant first order autocorrelation coefficients that change sign in the second sub-period of our sample with respect to the first one. This suggests variability in the serial correlation functions, which deserves further investigation, perhaps with a Kalman filter model, which captures time variation in the underlying parameters.

Estimates of variance ratios under the RW1 and RW3 null hypotheses also revealed certain departures from the random walk with drift model. As expected, the number of rejections under the RW3 hypothesis was somewhat smaller, lending certain support to the conjecture that in broad terms the market was not so far away from being efficient. Interestingly enough, the test statistics revealed that the random walk hypothesis was rejected less often for the individual securities than for the market index SOFIX and the two artificial portfolios. Unfortunately, we could not compare this result to those obtained in similar studies for other transition countries, as the other studies used data on either market indices or on individual stocks only.

Our most surprising finding, however, was that the degree of weak form efficiency of the Bulgarian Stock Exchange was higher in the earlier sub-period (from October 2000 till October 2003), i.e. it seems that the market diverged from the state of efficiency instead of converging to it. Yet, even if that was the case, we could not find a filter rule approach to generate profits superior to those of a simple buy-and-hold strategy. In other words, the lack of support for the random walk model does not necessarily imply the inefficiency of the price formation mechanism of the Bulgarian Stock Exchange.

# APPENDICES

## APPENDIX 1

Table 1

**AUTOCORRELATIONS AND BOX-PIERCE Q-STATISTIC FOR DAILY STOCK RETURNS (P-VALUES IN PARENTHESES)**

| Sample period | Number of obs. | Mean Value | St. Dev. | ρ1 | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *ALBHL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.028 | -0.084 | -0.086 | 0.020 | -0.024 | 11.55 | 13.87 | 15.45 |
| | | | | | | (0.021) | (0.085) | (0.218) | | |
| Oct 21, 2003 - Nov 23, 2006 | 776 | 0.002 | 0.022 | 0.146 | 0.143 | 0.099 | -0.061 | 42.98 | 51.88 | 53.53 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.025 | 0.005 | 0.002 | 0.050 | -0.037 | 6.04 | 11.89 | 13.76 |
| | | | | | | | | (0.196) | (0.156) | (0.316) |
| *IHLBL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.029 | -0.097 | 0.120 | -0.053 | 0.076 | 24.22 | 26.82 | 29.55 |
| | | | | | | | | (0.000) | (0.001) | (0.003) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.003 | 0.030 | -0.011 | 0.113 | -0.049 | 0.091 | 18.30 | 39.22 | 51.07 |
| | | | | | | | | (0.001) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.030 | -0.058 | 0.113 | -0.064 | 0.097 | 45.07 | 59.41 | 67.96 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *PETHL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.020 | -0.018 | 0.121 | 0.085 | 0.004 | 16.61 | 22.97 | 23.28 |
| | | | | | | | | (0.002) | (0.003) | (0.025) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.029 | 0.157 | 0.089 | 0.084 | 0.033 | 31.58 | 41.73 | 42.11 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.025 | 0.111 | 0.108 | 0.082 | 0.012 | 47.05 | 64.32 | 64.94 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *DOVUHL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.037 | -0.094 | -0.144 | 0.010 | 0.010 | 22.31 | 23.37 | 34.00 |
| | | | | | | | | (0.000) | (0.003) | (0.001) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.026 | 0.157 | 0.085 | 0.025 | 0.023 | 25.60 | 28.57 | 31.90 |
| | | | | | | | | (0.000) | (0.000) | (0.001) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | ρ1 | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.032 | -0.006 | -0.064 | 0.015 | 0.013 | 6.94 | 7.43 | 14.37 |
| | | | | | | | | (0.139) | (0.491) | (0.278) |
| *SFARM* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.075 | -0.003 | 0.007 | -0.007 | -0.099 | 7.43 | 8.31 | 9.85 |
| | | | | | | | | (0.115) | (0.403) | (0.629) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.017 | -0.056 | 0.043 | -0.044 | -0.037 | 6.41 | 18.50 | 21.99 |
| | | | | | | | | (0.171) | (0.018) | (0.038) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.054 | -0.005 | 0.009 | -0.008 | -0.096 | 14.24 | 16.12 | 19.12 |
| | | | | | | | | (0.007) | (0.041) | (0.086) |
| *LEV* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.017 | -0.126 | -0.063 | -0.011 | -0.143 | 30.24 | 39.28 | 48.65 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.014 | -0.246 | 0.064 | -0.040 | 0.044 | 52.95 | 55.14 | 57.23 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.016 | -0.176 | -0.011 | -0.030 | -0.060 | 54.25 | 63.78 | 69.32 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *PET* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.004 | 0.049 | -0.038 | 0.040 | 0.166 | -0.024 | 23.28 | 28.36 | 33.41 |
| | | | | | | | | (0.000) | (0.000) | (0.001) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.000 | 0.027 | -0.190 | -0.003 | -0.021 | -0.020 | 28.81 | 30.69 | 33.50 |
| | | | | | | | | (0.000) | (0.000) | (0.001) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.039 | -0.073 | 0.032 | 0.121 | -0.021 | 32.77 | 38.15 | 43.56 |
| *AFH* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.046 | -0.015 | 0.041 | -0.024 | -0.028 | 2.43 | 34.11 | 42.47 |
| | | | | | | | | (0.657) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.033 | -0.109 | 0.032 | 0.141 | 0.056 | 27.86 | 37.89 | 45.78 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | $\rho 1$ | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.040 | -0.047 | 0.039 | 0.034 | 0.002 | 7.38 (0.117) | 23.00 (0.003) | 31.34 (0.002) |
| *GAMZA* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.033 | -0.059 | -0.084 | -0.080 | -0.048 | 14.38 (0.006) | 19.17 (0.014) | 23.73 (0.022) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.032 | 0.034 | -0.014 | -0.046 | 0.002 | 2.66 (0.616) | 9.55 (0.298) | 12.08 (0.439) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.000 | 0.032 | -0.013 | -0.049 | -0.062 | -0.023 | 10.57 (0.032) | 16.19 (0.040) | 22.36 (0.034) |
| *ALB* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.023 | -0.065 | -0.145 | 0.010 | -0.002 | 18.94 (0.001) | 21.70 (0.005) | 26.00 (0.011) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.018 | -0.057 | 0.043 | 0.091 | -0.030 | 11.09 (0.026) | 38.31 (0.000) | 45.24 (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.020 | -0.062 | -0.073 | 0.041 | -0.013 | 16.68 (0.002) | 28.47 (0.000) | 34.31 (0.001) |
| *BHC* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.060 | 0.074 | 0.038 | 0.055 | 0.049 | 9.26 (0.055) | 22.80 (0.004) | 31.14 (0.002) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.036 | -0.027 | 0.005 | 0.075 | 0.061 | 7.76 (0.101) | 8.71 (0.368) | 17.11 (0.145) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.049 | 0.047 | 0.030 | 0.060 | 0.052 | 14.34 (0.006) | 26.56 (0.001) | 40.83 (0.000) |
| *SOFIX* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.026 | -0.131 | 0.045 | -0.054 | -0.004 | 16.50 (0.002) | 22.56 (0.004) | 35.74 (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.009 | 0.202 | 0.102 | -0.004 | 0.055 | 42.12 (0.000) | 51.95 (0.000) | 61.89 (0.000) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | $\rho 1$ | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.019 | -0.091 | 0.052 | -0.048 | 0.004 | 20.19 (0.000) | 29.51 (0.000) | 46.12 (0.000) |
| *Equally-weighted portfolio* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.015 | 0.063 | 0.051 | 0.092 | 0.063 | 14.23 (0.007) | 28.89 (0.000) | 31.68 (0.002) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.014 | 0.198 | 0.174 | 0.069 | 0.052 | 59.74 (0.000) | 79.99 (0.000) | 80.43 (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.014 | 0.128 | 0.109 | 0.081 | 0.057 | 57.99 (0.000) | 86.24 (0.000) | 87.77 (0.000) |
| *MarketCap-weighted portfolio* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.018 | 0.069 | 0.083 | 0.105 | 0.041 | 18.12 (0.001) | 23.58 (0.003) | 25.73 (0.012) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.014 | 0.022 | 0.096 | 0.024 | 0.019 | 8.28 (0.082) | 18.29 (0.019) | 18.48 (0.102) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.016 | 0.052 | 0.088 | 0.075 | 0.033 | 26.18 (0.000) | 34.71 (0.000) | 36.35 (0.000) |

Table 2

**AUTOCORRELATIONS AND BOX-PIERCE Q-STATISTIC FOR WEEKLY STOCK RETURNS (P-VALUES IN PARENTHESES)**

| Sample period | Number of obs. | Mean Value | St. Dev. | $\rho 1$ | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *ALBHL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.006 | 0.057 | -0.078 | 0.000 | -0.033 | 0.131 | 3.62 | 10.15 | 18.95 |
| | | | | | | | | (0.460) | (0.254) | (0.090) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.010 | 0.060 | 0.077 | 0.131 | -0.038 | 0.134 | 6.71 | 27.07 | 33.44 |
| | | | | | | | | (0.152) | (0.001) | (0.001) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.008 | 0.059 | 0.006 | 0.069 | -0.036 | 0.134 | 7.37 | 28.53 | 37.05 |
| | | | | | | | | (0.117) | (0.000) | (0.000) |
| *IHLBL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.005 | 0.069 | 0.026 | -0.068 | -0.038 | -0.170 | 5.30 | 6.71 | 12.36 |
| | | | | | | | | (0.258) | (0.568) | (0.417) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.015 | 0.067 | 0.395 | 0.296 | 0.181 | 0.139 | 46.64 | 57.49 | 75.47 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.010 | 0.068 | 0.214 | 0.117 | 0.074 | 0.000 | 20.00 | 24.73 | 41.81 |
| | | | | | | | | (0.000) | (0.002) | (0.000) |
| *PETHL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.000 | 0.052 | 0.170 | -0.024 | 0.012 | 0.032 | 4.55 | 14.48 | 17.42 |
| | | | | | | | | (0.336) | (0.070) | (0.134) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.011 | 0.079 | 0.227 | -0.036 | -0.063 | 0.075 | 9.88 | 31.51 | 32.20 |
| | | | | | | | | (0.043) | (0.000) | (0.001) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.006 | 0.067 | 0.201 | -0.044 | -0.040 | 0.077 | 15.30 | 36.02 | 37.44 |
| | | | | | | | | (0.004) | (0.000) | (0.000) |
| *DOVUHL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.007 | 0.067 | -0.041 | -0.211 | 0.012 | 0.017 | 6.96 | 8.50 | 9.83 |
| | | | | | | | | (0.138) | (0.386) | (0.631) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | $\rho 1$ | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.006 | 0.065 | 0.157 | -0.050 | 0.130 | 0.096 | 8.43 | 27.46 | 34.69 |
| | | | | | | | | (0.077) | (0.001) | (0.001) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.006 | 0.066 | 0.044 | -0.122 | 0.073 | 0.073 | 8.43 | 17.21 | 20.45 |
| | | | | | | | | (0.077) | (0.028) | (0.059) |
| *SFARM* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.005 | 0.166 | -0.114 | 0.024 | 0.057 | 0.086 | 3.63 | 4.02 | 9.23 |
| | | | | | | | | (0.459) | (0.855) | (0.683) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.009 | 0.035 | -0.026 | 0.128 | 0.027 | -0.024 | 2.90 | 6.84 | 10.70 |
| | | | | | | | | (0.575) | (0.554) | (0.555) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.007 | 0.118 | -0.110 | 0.030 | 0.055 | 0.080 | 6.89 | 7.44 | 16.79 |
| | | | | | | | | (0.142) | (0.490) | (0.158) |
| *LEV* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.002 | 0.030 | -0.151 | 0.042 | -0.130 | 0.185 | 11.25 | 13.88 | 15.23 |
| | | | | | | | | (0.024) | (0.085) | (0.229) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.004 | 0.027 | -0.081 | 0.014 | -0.147 | -0.152 | 8.12 | 8.74 | 9.86 |
| | | | | | | | | (0.087) | (0.364) | (0.628) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.003 | 0.029 | -0.117 | 0.034 | -0.115 | 0.051 | 9.44 | 11.43 | 12.94 |
| | | | | | | | | (0.051) | (0.178) | (0.373) |
| *PET* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.019 | 0.117 | 0.121 | -0.036 | -0.094 | -0.023 | 3.76 | 5.84 | 14.26 |
| | | | | | | | | (0.440) | (0.665) | (0.284) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.001 | 0.057 | -0.230 | -0.038 | 0.077 | 0.026 | 9.59 | 18.31 | 23.88 |
| | | | | | | | | (0.048) | (0.019) | (0.021) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.010 | 0.091 | 0.059 | -0.027 | -0.049 | -0.004 | 2.04 | 6.65 | 21.37 |
| | | | | | | | | (0.729) | (0.575) | (0.045) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | ρ1 | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *AFH* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.002 | 0.105 | -0.122 | -0.420 | 0.073 | 0.011 | 29.30 | 30.50 | 33.19 |
| | | | | | | | | (0.000) | (0.000) | (0.001) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.011 | 0.073 | 0.191 | 0.204 | 0.283 | 0.159 | 29.05 | 40.87 | 48.12 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.006 | 0.090 | -0.013 | -0.203 | 0.146 | 0.065 | 20.53 | 23.47 | 26.32 |
| | | | | | | | | (0.000) | (0.003) | (0.010) |
| *GAMZA* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | -0.001 | 0.064 | -0.108 | -0.120 | 0.043 | -0.146 | 7.30 | 10.39 | 11.82 |
| | | | | | | | | (0.121) | (0.239) | (0.460) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.007 | 0.072 | 0.054 | -0.071 | -0.016 | 0.030 | 1.45 | 28.06 | 43.79 |
| | | | | | | | | (0.836) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.003 | 0.068 | -0.011 | -0.088 | 0.011 | -0.041 | 2.96 | 25.61 | 37.95 |
| | | | | | | | | (0.564) | (0.001) | (0.000) |
| *ALB* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.009 | 0.048 | -0.209 | -0.032 | 0.012 | 0.223 | 14.06 | 17.98 | 19.77 |
| | | | | | | | | (0.007) | (0.021) | (0.072) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.007 | 0.039 | 0.331 | -0.013 | -0.049 | 0.113 | 19.69 | 30.11 | 43.04 |
| | | | | | | | | (0.001) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.008 | 0.044 | 0.016 | -0.023 | -0.016 | 0.175 | 9.70 | 16.36 | 24.74 |
| | | | | | | | | (0.046) | (0.038) | (0.016) |
| *BHC* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.004 | 0.141 | 0.167 | -0.085 | -0.251 | -0.169 | 18.94 | 19.41 | 20.67 |
| | | | | | | | | (0.001) | (0.013) | (0.055) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.004 | 0.077 | 0.096 | -0.040 | 0.105 | 0.000 | 3.44 | 20.50 | 24.46 |
| | | | | | | | | (0.486) | (0.009) | (0.018) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.004 | 0.113 | 0.146 | -0.074 | -0.160 | -0.123 | 20.79 | 22.78 | 23.64 |
| | | | | | | | | (0.000) | (0.004) | (0.023) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | ρ1 | ρ2 | ρ3 | ρ4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *SOFIX* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | | 149 | 0.010 | 0.055 | -0.128 | -0.052 | 0.052 | 0.065 | 3.89 | 4.97 | 5.85 |
| | | | | | | | | | (0.422) | (0.761) | (0.923) |
| Oct 22, 2003 – Nov 21, 2006 | | 158 | 0.006 | 0.024 | 0.110 | 0.010 | -0.006 | -0.011 | 1.96 | 9.63 | 10.88 |
| | | | | | | | | | (0.744) | (0.292) | (0.539) |
| Oct 24, 2000 – Nov 21, 2006 | | 307 | 0.008 | 0.042 | -0.086 | -0.038 | 0.045 | 0.056 | 4.29 | 5.56 | 6.92 |
| | | | | | | | | | (0.368) | (0.697) | (0.863) |
| *Equally-weighted portfolio* | | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | | 149 | 0.008 | 0.036 | 0.196 | 0.002 | -0.088 | -0.014 | 6.91 | 23.00 | 30.69 |
| | | | | | | | | | (0.141) | (0.003) | (0.002) |
| Oct 22, 2003 – Nov 21, 2006 | | 158 | 0.007 | 0.039 | 0.222 | 0.080 | 0.087 | 0.157 | 13.89 | 36.19 | 47.46 |
| | | | | | | | | | (0.008) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | | 307 | 0.007 | 0.038 | 0.209 | 0.045 | 0.010 | 0.083 | 16.25 | 51.25 | 65.26 |
| | | | | | | | | | (0.003) | (0.000) | (0.000) |
| *MarketCap-weighted portfolio* | | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | | 149 | 0.009 | 0.047 | 0.125 | 0.070 | 0.005 | 0.064 | 3.66 | 14.68 | 26.92 |
| | | | | | | | | | (0.455) | (0.066) | (0.008) |
| Oct 22, 2003 – Nov 21, 2006 | | 158 | 0.006 | 0.034 | 0.053 | 0.064 | 0.060 | 0.085 | 2.81 | 8.48 | 17.14 |
| | | | | | | | | | (0.591) | (0.388) | (0.144) |
| Oct 24, 2000 – Nov 21, 2006 | | 307 | 0.008 | 0.041 | 0.100 | 0.071 | 0.028 | 0.075 | 6.60 | 19.98 | 37.66 |
| | | | | | | | | | (0.158) | (0.010) | (0.000) |

Table 3

**VARIANCE RATIOS FOR DAILY STOCK RETURNS (RW1 NULL HYPOTHESIS)**

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *ALBHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.92 | 0.80 | 0.75 | 0.75 | 0.75 |
| | | | (-2.23)* | (-2.86)* | (-2.33)* | (-1.81) |
| (-1.58) | | | | | | |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.15 | 1.42 | 1.65 | 1.83 | 1.96 |
| | | (4.11)* | (6.27)* | (6.12)* | (6.13)* | (6.08)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.01 | 1.04 | 1.09 | 1.15 | 1.19 |
| | | (0.24) | (0.8) | (1.15) | (1.59) | (1.73) |
| *IHLBL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.90 | 0.92 | 1.02 | 1.05 | 1.04 |
| | | (-2.69)* | (-1.12) | (0.16) | (0.4) | (0.26) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.98 | 1.05 | 1.31 | 1.58 | 1.80 |
| | | (-0.68) | (0.8) | (2.88)* | (4.34)* | (5.08)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.94 | 1.00 | 1.17 | 1.34 | 1.45 |
| | | (-2.21)* | (-0.1) | (2.26)* | (3.53)* | (3.99)* |
| *PETHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.97 | 1.10 | 1.29 | 1.38 | 1.42 |
| | | (-0.87) | (1.5) | (2.66)* | (2.77)* | (2.64)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.37 | 1.64 | 1.81 | 1.88 |
| | | (4.37)* | (5.49)* | (6.05)* | (6.04)* | (5.59)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.11 | 1.32 | 1.56 | 1.72 | 1.78 |
| | | (4.37)* | (6.68)* | (7.34)* | (7.46)* | (6.92)* |
| *DOVUHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.91 | 0.72 | 0.62 | 0.55 | 0.53 |
| | | (-2.53)* | (-4.09)* | (-3.47)* | (-3.32)* | (-2.91)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.15 | 1.33 | 1.51 | 1.57 | 1.61 |
| | | (4.26)* | (4.98)* | (4.76)* | (4.22)* | (3.86)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.99 | 0.94 | 0.93 | 0.89 | 0.89 |
| | | (-0.22) | (-1.31) | (-0.97) | (-1.2) | (-1.02) |
| *SFARM* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.00 | 1.01 | 0.89 | 0.86 | 0.87 |
| | | (-0.01) | (0.11) | (-0.98) | (-0.99) | (-0.83) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.95 | 0.94 | 0.89 | 0.97 | 1.02 |
| | | (-1.48) | (-0.84) | (-1.01) | (-0.2) | (0.14) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.00 | 1.00 | 0.89 | 0.86 | 0.86 |
| | | (-0.16) | (0.01) | (-1.5) | (-1.47) | (-1.25) |
| *LEV* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.88 | 0.75 | 0.56 | 0.50 | 0.47 |
| | | (-3.38)* | (-3.68)* | (-4.11)* | (-3.63)* | (-3.31)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.76 | 0.58 | 0.53 | 0.51 | 0.49 |
| | | (-6.81)* | (-6.25)* | (-4.39)* | (-3.64)* | (-3.2)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.83 | 0.71 | 0.59 | 0.55 | 0.53 |
| | | (-6.82)* | (-5.99)* | (-5.4)* | (-4.66)* | (-4.13)* |
| *PET* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.96 | 1.07 | 1.23 | 1.27 | 1.25 |
| | | (-0.97) | (1.08) | (2.15)* | (1.96) | (1.57) |
| Oct 21, 2003 - Nov 23, 2006 | 776 | 0.81 | 0.70 | 0.64 | 0.58 | 0.57 |
| | | (-5.25)* | (-4.4)* | (-3.41)* | (-3.13)* | (-2.69)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.93 | 0.99 | 1.09 | 1.11 | 1.10 |
| | | (-2.82)* | (-0.3) | (1.2) | (1.1) | (0.86) |
| *AFH* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.99 | 1.02 | 0.83 | 0.56 | 0.42 |
| | | (-0.33) | (0.23) | (-1.54) | (-3.22)* | (-3.6)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.89 | 0.95 | 1.16 | 1.37 | 1.59 |
| | | (-2.98)* | (-0.82) | (1.55) | (2.77)* | (3.75)* |
| Oct 23, 2000 - Nov 23, 2006 | 1525 | 0.95 | 0.99 | 0.94 | 0.84 | 0.82 |
| | | (-1.78) | (-0.23) | (-0.74) | (-1.69) | (-1.57) |
| *GAMZA* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.94 | 0.79 | 0.66 | 0.60 | 0.59 |
| | | (-1.55) | (-3.01)* | (-3.11)* | (-2.91)* | (-2.52)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.04 | 1.02 | 1.07 | 1.13 | 1.15 |
| | | (1.03) | (0.34) | (0.7) | (0.95) | (0.92) |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 0.99 | 0.90 | 0.86 | 0.86 | 0.86 |
| | | (-0.46) | (-2)* | (-1.82) | (-1.49) | (-1.23) |
| *ALB* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.94 | 0.77 | 0.68 | 0.64 | 0.65 |
| | | (-1.72) | (-3.41)* | (-2.96)* | (-2.61)* | (-2.19)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.94 | 1.01 | 1.20 | 1.40 | 1.49 |
| | | (-1.58) | (0.14) | (1.86) | (2.96)* | (3.07)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.94 | 0.86 | 0.87 | 0.93 | 0.96 |
| | | (-2.4)* | (-3)* | (-1.69) | (-0.73) | (-0.33) |
| *BHC* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.08 | 1.18 | 1.37 | 1.43 | 1.39 |
| | | (2.1)* | (2.63)* | (3.43)* | (3.12)* | (2.44)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.98 | 1.01 | 1.13 | 1.15 | 1.16 |
| | | (-0.69) | (0.14) | (1.23) | (1.13) | (1.03) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.13 | 1.31 | 1.36 | 1.34 |
| | | (1.88) | (2.81)* | (4.14)* | (3.79)* | (3.05)* |
| *SOFIX* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.87 | 0.83 | 0.77 | 0.73 | 0.74 |
| | | (-3.51)* | (-2.51)* | (-2.08)* | (-1.99)* | (-1.61) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.41 | 1.65 | 1.83 | 1.88 |
| | | (5.64)* | (6.08)* | (6.13)* | (6.19)* | (5.6)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.91 | 0.89 | 0.87 | 0.85 | 0.87 |
| | | (-3.5)* | (-2.19)* | (-1.67) | (-1.57) | (-1.2) |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.07 | 1.20 | 1.50 | 1.61 | 1.65 |
| | | (1.81) | (2.93)* | (4.66)* | (4.42)* | (4.05)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.51 | 1.89 | 2.15 | 2.34 |
| | | (5.6)* | (7.62)* | (8.36)* | (8.57)* | (8.45)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.13 | 1.35 | 1.67 | 1.84 | 1.95 |
| | | (5.05)* | (7.2)* | (8.89)* | (8.79)* | (8.38)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.07 | 1.25 | 1.51 | 1.63 | 1.74 |
| | | (1.95) | (3.61)* | (4.71)* | (4.59)* | (4.57)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.02 | 1.15 | 1.31 | 1.44 | 1.54 |
| | | (0.69) | (2.19)* | (2.91)* | (3.26)* | (3.39)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.21 | 1.43 | 1.55 | 1.64 |
| | | (2.08)* | (4.33)* | (5.65)* | (5.69)* | (5.71)* |

**Notes:** Test statistic values in parenthesis.
*indicates significance at 5 per cent level.

Table 4

**VARIANCE RATIOS FOR WEEKLY STOCK RETURNS (RW1 NULL HYPOTHESIS)**

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *ALBHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.93 | 0.89 | 1.10 | 1.15 | 0.99 |
| | | (-0.85) | (-0.69) | (0.39) | (0.47) | (-0.02) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.09 | 1.27 | 1.82 | 2.29 | 2.68 |
| | | (1.13) | (1.79) | (3.46)* | (4.34)* | (4.81)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.01 | 1.08 | 1.44 | 1.75 | 1.94 |
| | | (0.19) | (0.73) | (2.61)* | (3.52)* | (3.74)* |
| *IHLBL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.04 | 0.97 | 0.65 | 0.44 | 0.52 |
| | | (0.49) | (-0.2) | (-1.46) | (-1.83) | (-1.34) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.41 | 2.02 | 2.87 | 3.58 | 4.30 |
| | | (5.13)* | (6.85)* | (7.93)* | (8.66)* | (9.43)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.22 | 1.49 | 1.81 | 2.07 | 2.44 |
| | | (3.86)* | (4.59)* | (4.78)* | (5.01)* | (5.75)* |
| *PETHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.14 | 1.11 | 1.00 | 0.89 | 0.85 |
| | | (1.69) | (0.71) | (0.01) | (-0.35) | (-0.41) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.24 | 1.31 | 1.75 | 2.25 | 2.58 |
| | | (2.99)* | (2.1)* | (3.2)* | (4.2)* | (4.52)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.21 | 1.26 | 1.53 | 1.83 | 2.02 |
| | | (3.64)* | (2.45)* | (3.14)* | (3.9)* | (4.07)* |
| *DOVUHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.94 | 0.74 | 0.69 | 0.65 | 0.64 |
| | | (-0.74) | (-1.7) | (-1.27) | (-1.12) | (-1.01) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.29 | 1.88 | 2.38 | 2.78 |
| | | (2.07)* | (1.95) | (3.76)* | (4.64)* | (5.07)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.00 | 1.24 | 1.42 | 1.55 |
| | | (0.85) | (-0.02) | (1.41) | (1.96)* | (2.2)* |
| *SFARM* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.90 | 0.92 | 1.05 | 1.21 | 1.36 |
| | | (-1.24) | (-0.55) | (0.22) | (0.68) | (0.99) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.98 | 1.14 | 1.22 | 1.07 | 0.93 |
| | | (-0.21) | (0.92) | (0.94) | (0.24) | (-0.21) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.90 | 0.91 | 1.02 | 1.13 | 1.21 |
| | | (-1.82) | (-0.84) | (0.15) | (0.59) | (0.85) |
| *LEV* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.86 | 0.78 | 0.88 | 0.87 | 0.83 |
| | | (-1.69) | (-1.47) | (-0.52) | (-0.41) | (-0.48) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.83 | 0.70 | 0.55 | 0.53 | 0.49 |
| | | (-2.17)* | (-2.04)* | (-1.92) | (-1.59) | (-1.45) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.89 | 0.81 | 0.82 | 0.76 | 0.69 |
| | | (-1.95) | (-1.75) | (-1.1) | (-1.11) | (-1.24) |
| *PET* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.14 | 1.14 | 1.18 | 1.38 | 1.66 |
| | | (1.65) | (0.93) | (0.76) | (1.25) | (1.84) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.78 | 0.68 | 0.67 | 0.59 | 0.56 |
| | | (-2.76)* | (-2.14)* | (-1.42) | (-1.36) | (-1.26) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.07 | 1.06 | 1.10 | 1.25 | 1.47 |
| | | (1.15) | (0.54) | (0.61) | (1.17) | (1.87) |
| AFH | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.89 | 0.45 | 0.25 | 0.11 | 0.10 |
| | | (-1.35) | (-3.56)* | (-3.1)* | (-2.91)* | (-2.5)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.69 | 2.56 | 3.22 | 3.66 |
| | | (2.57)* | (4.62)* | (6.62)* | (7.45)* | (7.6)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.99 | 0.87 | 1.01 | 1.12 | 1.24 |
| | | (-0.13) | (-1.24) | (0.08) | (0.56) | (0.94) |
| GAMZA | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.90 | 0.76 | 0.64 | 0.54 | 0.51 |
| | | (-1.16) | (-1.56) | (-1.5) | (-1.51) | (-1.36) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.07 | 1.04 | 1.44 | 1.77 | 2.10 |
| | | (0.85) | (0.28) | (1.86) | (2.58)* | (3.16)* |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 1.00 | 0.92 | 1.08 | 1.21 | 1.36 |
| | | (-0.09) | (-0.76) | (0.47) | (1) | (1.45) |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *ALB* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.80 | 0.69 | 0.86 | 1.04 | 1.21 |
| | | (-2.43)* | (-2.03)* | (-0.6) | (0.13) | (0.59) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.34 | 1.48 | 1.90 | 2.19 | 2.52 |
| | | (4.31)* | (3.21)* | (3.84)* | (3.98)* | (4.34)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.02 | 1.01 | 1.25 | 1.43 | 1.65 |
| | | (0.37) | (0.09) | (1.48) | (2.01)* | (2.57)* |
| *BHC* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.17 | 1.04 | 0.65 | 0.44 | 0.45 |
| | | (2.07)* | (0.26) | (-1.46) | (-1.81) | (-1.53) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.11 | 1.20 | 1.55 | 1.91 | 2.24 |
| | | (1.36) | (1.33) | (2.32)* | (3.04)* | (3.53)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.15 | 1.09 | 0.88 | 0.79 | 0.84 |
| | | (2.68)* | (0.81) | (-0.73) | (-0.98) | (-0.63) |
| *SOFIX* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.88 | 0.81 | 0.86 | 0.90 | 0.91 |
| | | (-1.47) | (-1.24) | (-0.59) | (-0.31) | (-0.24) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.12 | 1.21 | 1.30 | 1.18 | 1.08 |
| | | (1.5) | (1.43) | (1.25) | (0.59) | (0.23) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.92 | 0.87 | 0.92 | 0.92 | 0.93 |
| | | (-1.45) | (-1.22) | (-0.48) | (-0.37) | (-0.27) |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.21 | 1.30 | 1.58 | 2.08 | 2.54 |
| | | (2.57)* | (1.98)* | (2.39)* | (3.51)* | (4.28)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.23 | 1.51 | 2.24 | 2.84 | 3.32 |
| | | (2.94)* | (3.39)* | (5.25)* | (6.16)* | (6.61)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.22 | 1.39 | 1.88 | 2.36 | 2.78 |
| | | (3.79)* | (3.65)* | (5.23)* | (6.35)* | (7.09)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.14 | 1.31 | 1.66 | 2.21 | 2.73 |
| | | (1.69) | (2.01)* | (2.71)* | (3.94)* | (4.81)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.06 | 1.21 | 1.55 | 1.74 | 1.95 |
| | | (0.79) | (1.43) | (2.33)* | (2.49)* | (2.71)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.11 | 1.26 | 1.59 | 1.95 | 2.33 |
| | | (1.87) | (2.41)* | (3.47)* | (4.42)* | (5.31)* |

**Notes:** Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

Table 5

**VARIANCE RATIOS FOR DAILY STOCK RETURNS (RW3 NULL HYPOTHESIS)**

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *ALBHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.92 | 0.80 | 0.73 | 0.73 | 0.72 |
| | | (-1.73) | (-1.73) | (-1.47) | (-1.26) | (-1.19) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.15 | 1.41 | 1.62 | 1.78 | 1.89 |
| | | (2.5)* | (3.57)* | (3.46)* | (3.53)* | (3.56)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.00 | 1.03 | 1.08 | 1.14 | 1.17 |
| | | (0.13) | (0.41) | (0.59) | (0.87) | (0.99) |
| *IHLBL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.90 | 0.95 | 1.05 | 1.11 | 1.11 |
| | | (-1.2) | (-0.37) | (0.24) | (0.39) | (0.35) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.99 | 1.07 | 1.32 | 1.59 | 1.79 |
| | | (-0.18) | (0.66) | (1.93) | (2.87)* | (3.35)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.94 | 0.99 | 1.17 | 1.34 | 1.45 |
| | | (-1.14) | (-0.07) | (1.24) | (1.98)* | (2.29)* |
| *PETHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.98 | 1.14 | 1.32 | 1.46 | 1.53 |
| | | (-0.17) | (0.7) | (1.2) | (1.49) | (1.61) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.37 | 1.62 | 1.77 | 1.82 |
| | | (2.5)* | (3.16)* | (3.48)* | (3.53)* | (3.3)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.11 | 1.32 | 1.54 | 1.69 | 1.75 |
| | | (2.02)* | (3.11)* | (3.61)* | (3.85)* | (3.69)* |
| *DOVUHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.91 | 0.72 | 0.62 | 0.54 | 0.52 |
| | | (-2.4)* | (-3.48)* | (-2.85)* | (-2.72)* | (-2.42)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.33 | 1.48 | 1.53 | 1.55 |
| | | (2.7)* | (3.22)* | (3.18)* | (2.89)* | (2.71)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.99 | 0.93 | 0.92 | 0.88 | 0.87 |
| | | (-0.2) | (-1.03) | (-0.8) | (-0.97) | (-0.87) |
| *SFARM* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.00 | 1.00 | 0.88 | 0.84 | 0.83 |
| | | (-0.17) | (-0.01) | (-1.44) | (-1.06) | (-0.87) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.94 | 0.94 | 0.88 | 0.95 | 0.99 |
| | | (-0.72) | (-0.48) | (-0.64) | (-0.22) | (-0.04) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.99 | 1.00 | 0.88 | 0.85 | 0.84 |
| | | (-0.33) | (-0.1) | (-1.5) | (-1.06) | (-0.86) |
| *LEV* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.87 | 0.74 | 0.54 | 0.49 | 0.45 |
| | | (-3.11)* | (-3.45)* | (-2.9)* | (-2.46)* | (-2.24)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.75 | 0.67 | 0.65 | 0.63 | 0.62 |
| | | (-2.9)* | (-2.31)* | (-1.92) | (-1.81) | (-1.73) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.82 | 0.71 | 0.59 | 0.54 | 0.53 |
| | | (-4.14)* | (-3.96)* | (-3.47)* | (-3.06)* | (-2.79)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *PET* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.96 | 1.07 | 1.21 | 1.23 | 1.20 |
| | | (-0.71) | (0.7) | (1.4) | (1.28) | (0.99) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.81 | 0.70 | 0.63 | 0.57 | 0.56 |
| | | (-2.88)* | (-2.65)* | (-2.3)* | (-2.26)* | (-2.05)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.93 | 0.98 | 1.08 | 1.09 | 1.08 |
| | | (-1.68) | (-0.23) | (0.68) | (0.62) | (0.46) |
| *AFH* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.99 | 1.01 | 0.82 | 0.54 | 0.40 |
| | | (-0.32) | (0.09) | (-1.12) | (-1.86) | (-1.97)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.89 | 0.94 | 1.14 | 1.34 | 1.54 |
| | | (-1.81) | (-0.56) | (0.88) | (1.71) | (2.39)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.95 | 0.99 | 0.94 | 0.83 | 0.81 |
| | | (-1.25) | (-0.23) | (-0.53) | (-0.99) | (-0.9) |
| *GAMZA* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.94 | 0.79 | 0.65 | 0.59 | 0.58 |
| | | (-0.75) | (-1.49) | (-1.71) | (-1.69) | (-1.55) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.03 | 1.02 | 1.06 | 1.10 | 1.10 |
| | | (0.59) | (0.14) | (0.34) | (0.47) | (0.43) |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 0.99 | 0.90 | 0.85 | 0.84 | 0.84 |
| | | (-0.26) | (-1.11) | (-1.11) | (-0.97) | (-0.85) |
| *ALB* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.93 | 0.76 | 0.67 | 0.62 | 0.62 |
| | | (-1.35) | (-1.71) | (-1.56) | (-1.52) | (-1.39) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.94 | 1.00 | 1.18 | 1.39 | 1.46 |
| | | (-0.84) | (0.03) | (1.01) | (1.75) | (1.83) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.94 | 0.85 | 0.87 | 0.92 | 0.95 |
| | | (-1.57) | (-1.49) | (-0.91) | (-0.47) | (-0.28) |
| *BHC* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.07 | 1.18 | 1.37 | 1.43 | 1.39 |
| | | (2.21)* | (2.79)* | (3.11)* | (2.4)* | (1.73) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.97 | 1.00 | 1.11 | 1.12 | 1.12 |
| | | (-0.52) | (0.03) | (0.76) | (0.66) | (0.57) |
| Oct 23, 2000 - Nov 23, 2006 | 1525 | 1.05 | 1.13 | 1.30 | 1.35 | 1.32 |
| | | (1.67) | (2.46)* | (3.13)* | (2.48)* | (1.82) |
| *SOFIX* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.87 | 0.82 | 0.77 | 0.72 | 0.73 |
| | | (-1.43) | (-1.24) | (-1.26) | (-1.33) | (-1.15) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.40 | 1.64 | 1.80 | 1.83 |
| | | (3.09)* | (3.56)* | (3.85)* | (3.91)* | (3.52)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.91 | 0.89 | 0.88 | 0.86 | 0.86 |
| | | (-1.12) | (-0.85) | (-0.76) | (-0.79) | (-0.65) |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.06 | 1.19 | 1.48 | 1.56 | 1.59 |
| | | (1.77) | (2.8)* | (4.27)* | (3.75)* | (3.23)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.51 | 1.87 | 2.11 | 2.27 |
| | | (3.57)* | (4.91)* | (5.6)* | (5.9)* | (5.91)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.13 | 1.34 | 1.66 | 1.82 | 1.91 |
| | | (3.94)* | (5.61)* | (7.02)* | (6.91)* | (6.52)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.07 | 1.24 | 1.48 | 1.58 | 1.67 |
| | | (1.86) | (3.43)* | (4.29)* | (4.1)* | (4.06)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.02 | 1.14 | 1.30 | 1.41 | 1.49 |
| | | (0.37) | (1.33) | (1.93) | (2.21)* | (2.3)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.20 | 1.42 | 1.53 | 1.61 |
| | | (1.6) | (3.44)* | (4.56)* | (4.63)* | (4.69)* |

**Notes:** Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

**Table 6**

**VARIANCE RATIOS FOR WEEKLY STOCK RETURNS (RW3 NULL HYPOTHESIS)**

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *ALBHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.92 | 0.87 | 1.02 | 1.12 | 1.13 |
| | | (-0.54) | (-0.59) | (0.07) | (0.32) | (0.32) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.08 | 1.23 | 1.68 | 2.04 | 2.28 |
| | | (0.58) | (1.06) | (2.1)* | (2.48)* | (2.56)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.01 | 1.06 | 1.38 | 1.64 | 1.78 |
| | | (0.06) | (0.39) | (1.7) | (2.27)* | (2.33)* |
| *IHLBL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.03 | 0.95 | 0.69 | 0.53 | 0.58 |
| | | (0.25) | (-0.27) | (-1.21) | (-1.47) | (-1.13) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.39 | 1.97 | 2.69 | 3.25 | 3.80 |
| | | (2.79)* | (4.01)* | (4.98)* | (5.49)* | (5.89)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.21 | 1.47 | 1.74 | 1.95 | 2.24 |
| | | (2.38)* | (3.12)* | (3.39)* | (3.48)* | (3.89)* |
| *PETHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.17 | 1.24 | 1.08 | 0.89 | 0.81 |
| | | (1.26) | (1.15) | (0.28) | (-0.28) | (-0.43) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.23 | 1.27 | 1.62 | 1.98 | 2.16 |
| | | (1.25) | (0.91) | (1.55) | (1.97)* | (2.01)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.20 | 1.24 | 1.47 | 1.72 | 1.85 |
| | | (1.47) | (1.06) | (1.56) | (1.92) | (1.96)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *DOVUHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.96 | 0.73 | 0.65 | 0.60 | 0.56 |
| | | (-0.52) | (-1.34) | (-1.18) | (-1.16) | (-1.14) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.25 | 1.75 | 2.10 | 2.33 |
| | | (1.46) | (1.36) | (2.82)* | (3.25)* | (3.33)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.04 | 0.98 | 1.19 | 1.34 | 1.43 |
| | | (0.66) | (-0.14) | (0.96) | (1.38) | (1.53) |
| *SFARM* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.89 | 0.88 | 0.99 | 1.08 | 1.23 |
| | | (-1.5) | (-0.68) | (-0.05) | (0.28) | (0.68) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.97 | 1.10 | 1.16 | 1.01 | 0.87 |
| | | (-0.18) | (0.42) | (0.46) | (0.03) | (-0.3) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.89 | 0.89 | 1.00 | 1.08 | 1.20 |
| | | (-1.51) | (-0.64) | (-0.01) | (0.27) | (0.63) |
| *LEV* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.85 | 0.75 | 0.88 | 0.95 | 0.95 |
| | | (-0.88) | (-0.86) | (-0.27) | (-0.1) | (-0.08) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.92 | 0.82 | 0.59 | 0.51 | 0.44 |
| | | (-0.78) | (-1.06) | (-1.58) | (-1.59) | (-1.66) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.88 | 0.80 | 0.81 | 0.80 | 0.77 |
| | | (-1.13) | (-1.14) | (-0.71) | (-0.63) | (-0.67) |
| *PET* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.12 | 1.10 | 1.08 | 1.20 | 1.39 |
| | | (1.3) | (0.62) | (0.27) | (0.5) | (0.83) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.77 | 0.66 | 0.63 | 0.54 | 0.49 |
| | | (-2.05)* | (-1.75) | (-1.22) | (-1.24) | (-1.2) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.06 | 1.04 | 1.06 | 1.17 | 1.34 |
| | | (0.74) | (0.28) | (0.23) | (0.51) | (0.88) |
| *AFH* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.88 | 0.44 | 0.23 | 0.15 | 0.12 |
| | | (-0.97) | (-1.27) | (-1.2) | (-1.19) | (-1.16) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.19 | 1.63 | 2.36 | 2.83 | 3.05 |
| | | (1.48) | (2.55)* | (3.67)* | (4.01)* | (3.88)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.99 | 0.85 | 0.97 | 1.09 | 1.15 |
| | | (-0.14) | (-0.49) | (-0.06) | (0.17) | (0.29) |
| *GAMZA* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.89 | 0.74 | 0.59 | 0.47 | 0.42 |
| | | (-0.84) | (-1.22) | (-1.31) | (-1.4) | (-1.35) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.05 | 1.00 | 1.33 | 1.57 | 1.78 |
| | | (0.39) | (0.01) | (0.94) | (1.27) | (1.48) |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 0.99 | 0.90 | 1.04 | 1.14 | 1.25 |
| | | (-0.12) | (-0.61) | (0.15) | (0.45) | (0.69) |
| *ALB* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.79 | 0.66 | 0.79 | 0.93 | 1.07 |
| | | (-1.26) | (-1.28) | (-0.59) | (-0.18) | (0.17) |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.33 | 1.46 | 1.78 | 1.94 | 2.13 |
| | | (2.31)* | (1.98)* | (2.21)* | (2.1)* | (2.15)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.02 | 0.99 | 1.20 | 1.35 | 1.53 |
| | | (0.14) | (-0.04) | (0.79) | (1.15) | (1.54) |
| *BHC* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.17 | 1.04 | 0.65 | 0.55 | 0.53 |
| | | (1.48) | (0.18) | (-0.92) | (-1.01) | (-0.98) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.10 | 1.16 | 1.43 | 1.73 | 1.94 |
| | | (0.62) | (0.6) | (1.18) | (1.65) | (1.82) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.15 | 1.07 | 0.84 | 0.80 | 0.81 |
| | | (1.57) | (0.37) | (-0.54) | (-0.56) | (-0.48) |
| SOFIX | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.87 | 0.78 | 0.80 | 0.81 | 0.83 |
| | | (-1.02) | (-1.08) | (-0.74) | (-0.6) | (-0.47) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.11 | 1.17 | 1.20 | 1.07 | 0.93 |
| | | (0.98) | (0.87) | (0.68) | (0.18) | (-0.15) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.91 | 0.86 | 0.88 | 0.86 | 0.86 |
| | | (-0.81) | (-0.84) | (-0.51) | (-0.49) | (-0.44) |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.19 | 1.25 | 1.49 | 1.89 | 2.35 |
| | | (2.18)* | (1.55) | (1.89) | (2.68)* | (3.5)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.22 | 1.45 | 2.07 | 2.50 | 2.77 |
| | | (1.67) | (2.06)* | (3.29)* | (3.65)* | (3.68)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.21 | 1.36 | 1.81 | 2.21 | 2.55 |
| | | (2.51)* | (2.57)* | (3.79)* | (4.46)* | (4.88)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.12 | 1.26 | 1.57 | 2.00 | 2.51 |
| | | (1.59) | (1.79) | (2.35)* | (3.18)* | (4.06)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.05 | 1.17 | 1.44 | 1.54 | 1.63 |
| | | (0.5) | (0.91) | (1.44) | (1.41) | (1.42) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.10 | 1.23 | 1.54 | 1.85 | 2.19 |
| | | (1.57) | (2.02)* | (2.82)* | (3.43)* | (4.14)* |

**Notes:** Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

Table 7

**SUMMARY OF THE TEST STATISTICS PRESENTED IN SECTION 5.1**

**Panel A: Summary of the results related to the autocorrelation coefficients**

| Sample period | ρ1 | ρ2 | ρ3 | ρ4 | ρ1 | ρ2 | ρ3 | ρ4 |
|---|---|---|---|---|---|---|---|---|
| *Number of sign reversals in r across sub-periods* | | | | | *(per cent)* | | | |
| – daily data | 6 | 5 | 2 | 4 | 42.9 | 35.7 | 14.3 | 28.6 |
| – weekly data | 7 | 4 | 8 | 7 | 50.0 | 28.6 | 57.1 | 50.0 |
| *Number of larger r in the second sub-period as compared to the first one* | | | | | *(per cent)* | | | |
| – daily data | 9 | 6 | 7 | 8 | 64.3 | 42.9 | 50.0 | 57.1 |
| – weekly data | 7 | 6 | 8 | 7 | 50.0 | 42.9 | 57.1 | 50.0 |

**Panel B: Number of statistically significant Box – Pierce, Q-statistics**

| Sample period | Number of observations | Q4 | Q8 | Q12 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|
| *Daily data* | | | | | *(per cent)* | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 12 | 13 | 12 | 85.7 | 92.9 | 85.7 |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 9 | 13 | 11 | 64.3 | 92.9 | 78.6 |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 11 | 11 | 11 | 78.6 | 78.6 | 78.6 |
| *Weekly data* | | | | | *(per cent)* | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 5 | 5 | 3 | 35.7 | 35.7 | 21.4 |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 5 | 11 | 11 | 35.7 | 78.6 | 78.6 |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 5 | 8 | 10 | 35.7 | 57.1 | 71.4 |

Table 8

## SUMMARY OF THE TEST STATISTICS PRESENTED IN SECTION 5.2

**Panel A: Summary data for the tests of the RW1 null hypothesis**

*Number of times RW1 hypothesis rejected (out of 14 possible cases)*

| Sample period | Number q of base observations aggregated to form variance ratio | | | | | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 4 | 8 | 12 | 16 | 2 | 4 | 8 | 12 | 16 |
| | *daily data* | | | | | *weekly data* | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 6 | 9 | 11 | 10 | 9 | 3 | 4 | 3 | 3 | 3 |
| Oct 21, 2003 – Nov 23, 2006 | 8 | 8 | 9 | 11 | 11 | 8 | 7 | 9 | 10 | 10 |
| Oct 23, 2000 – Nov 23, 2006 | 8 | 8 | 6 | 6 | 6 | 4 | 4 | 5 | 7 | 7 |

*Number of reversals of the value of the VR statistics with respect to 1 across sub-periods*

| | *daily data* | | | | | *weekly data* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 8 | 7 | 7 | 8 | 7 | 8 | 7 | 7 | 9 |

**Panel B: Summary data for the tests of the RW1 null hypothesis**

*Number of times RW3 hypothesis rejected out (of 14 possible cases)*

| Sample period | Number q of base observations aggregated to form variance ratio | | | | | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 4 | 8 | 12 | 16 | 2 | 4 | 8 | 12 | 16 |
| | daily data | | | | | weekly data | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 3 | 5 | 5 | 5 | 5 | 1 | 0 | 1 | 2 | 2 |
| Oct 21, 2003 – Nov 23, 2006 | 7 | 7 | 6 | 8 | 9 | 3 | 4 | 6 | 7 | 7 |
| Oct 23, 2000 – Nov 23, 2006 | 3 | 5 | 5 | 6 | 5 | 2 | 3 | 3 | 4 | 5 |

*Number of reversals of the value of the VR statistics with respect to 1 across sub-periods*

| | *daily data* | | | | | *weekly data* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 7 |

Table 9

**RATES OF RETURN BEFORE COMMISSIONS UNDER THE FILTER RULE (F) AND BUY-AND-HOLD STRATEGY (B)**

| | Filter size | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stocks | 0.005 | | 0.01 | | 0.015 | | 0.02 | | 0.025 | | 0.03 | |
| | F | B | F | B | F | B | F | B | F | B | F | B |
| ALBHL | -0.124 | 0.409 | -0.112 | 0.408 | -0.018 | 0.421 | -0.061 | 0.418 | 0.096 | 0.424 | 0.243 | 0.422 |
| IHLBL | -0.791 | 0.568 | -0.794 | 0.545 | -0.642 | 0.547 | -0.617 | 0.548 | -0.602 | 0.565 | -0.402 | 0.546 |
| PETHL | 0.376 | 0.344 | 0.262 | 0.360 | 0.311 | 0.366 | 0.267 | 0.370 | 0.239 | 0.363 | 0.203 | 0.361 |
| DOVUHL | -0.371 | 0.370 | -0.345 | 0.372 | -0.209 | 0.386 | -0.247 | 0.387 | -0.216 | 0.385 | -0.213 | 0.378 |
| SFARM | n.a. | 1.208 | n.a. | 1.209 | n.a. | 1.210 | n.a. | 1.210 | n.a. | 1.210 | n.a. | 1.210 |
| LEV | -0.402 | 0.166 | -0.402 | 0.178 | -0.430 | 0.184 | -0.384 | 0.179 | -0.424 | 0.179 | -0.363 | 0.182 |
| PET | -0.999 | 0.611 | -1.034 | 0.605 | -1.050 | 0.602 | -1.027 | 0.604 | -0.925 | 0.603 | -0.984 | 0.609 |
| AFH | -0.575 | 0.371 | -0.506 | 0.373 | -0.537 | 0.367 | -0.484 | 0.372 | -0.522 | 0.373 | -0.435 | 0.382 |
| GAMZA | 0.008 | 0.186 | 0.073 | 0.186 | 0.217 | 0.182 | 0.242 | 0.188 | 0.212 | 0.190 | 0.104 | 0.191 |
| ALB | -0.248 | 0.432 | -0.207 | 0.433 | -0.092 | 0.434 | -0.194 | 0.440 | -0.322 | 0.441 | -0.252 | 0.441 |
| BHC | 0.286 | 0.305 | 0.202 | 0.307 | 0.420 | 0.327 | 0.429 | 0.334 | 0.286 | 0.322 | 0.358 | 0.311 |
| Sofix | 0.063 | 0.404 | 0.017 | 0.402 | 0.049 | 0.401 | 0.122 | 0.402 | 0.045 | 0.403 | 0.013 | 0.404 |

Note: n.a. is used to denote cases where daily return can not be calculated (it happens when while having a short possition we incur a loss of more than 100 per cent).

| | Filter size | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stocks | 0.035 | | 0.04 | | 0.045 | | 0.05 | | 0.06 | | 0.07 | |
| | F | B | F | B | F | B | F | B | F | B | F | B |
| ALBHL | 0.215 | 0.405 | 0.243 | 0.406 | 0.305 | 0.407 | 0.211 | 0.399 | 0.127 | 0.416 | 0.186 | 0.438 |
| IHLBL | -0.369 | 0.554 | -0.324 | 0.551 | -0.024 | 0.709 | -0.071 | 0.711 | -0.017 | 0.694 | 0.237 | 0.722 |
| PETHL | 0.249 | 0.368 | 0.240 | 0.369 | 0.183 | 0.371 | 0.146 | 0.369 | 0.252 | 0.333 | 0.337 | 0.336 |
| DOVUHL | -0.255 | 0.379 | -0.199 | 0.382 | -0.109 | 0.391 | -0.041 | 0.387 | -0.005 | 0.381 | 0.001 | 0.368 |
| SFARM | n.a. | 1.210 | n.a. | 1.212 | n.a. | 1.214 | n.a. | 1.216 | n.a. | 1.243 | n.a. | 1.245 |
| LEV | -0.414 | 0.181 | -0.295 | 0.178 | -0.145 | 0.173 | -0.105 | 0.198 | -0.096 | 0.205 | -0.061 | 0.204 |
| PET | -0.949 | 0.611 | -0.857 | 0.614 | -0.755 | 0.610 | -0.480 | 0.603 | -0.129 | 0.592 | -0.110 | 0.583 |
| AFH | -0.413 | 0.372 | -0.454 | 0.371 | -0.388 | 0.373 | -0.326 | 0.378 | -0.239 | 0.371 | -0.188 | 0.424 |
| GAMZA | 0.080 | 0.195 | 0.024 | 0.191 | 0.043 | 0.187 | -0.030 | 0.234 | -0.038 | 0.228 | -0.221 | 0.222 |
| ALB | -0.151 | 0.442 | -0.092 | 0.441 | -0.051 | 0.459 | 0.220 | 0.519 | 0.275 | 0.512 | 0.269 | 0.489 |
| BHC | 0.360 | 0.308 | 0.422 | 0.318 | 0.370 | 0.305 | 0.438 | 0.309 | 0.346 | 0.309 | 0.521 | 0.320 |
| Sofix | -0.023 | 0.417 | -0.110 | 0.407 | -0.017 | 0.408 | 0.080 | 0.409 | 0.022 | 0.410 | 0.271 | 0.499 |

(continued)

(continued)

| | Filter size | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stocks | 0.08 | | 0.09 | | 0.1 | | 0.12 | | 0.14 | | 0.16 | |
| | F | B | F | B | F | B | F | B | F | B | F | B |
| ALBHL | 0.051 | 0.577 | 0.100 | 0.545 | 0.171 | 0.537 | 0.120 | 0.538 | 0.360 | 0.598 | 0.757 | 0.708 |
| IHLBL | 0.299 | 0.733 | 0.409 | 0.747 | 0.645 | 1.046 | 0.497 | 0.965 | 0.746 | 0.987 | | |
| PETHL | 0.288 | 0.332 | 0.545 | 0.650 | 0.636 | 0.670 | 0.564 | 0.649 | 0.738 | 0.597 | 0.377 | 0.525 |
| DOVUHL | -0.048 | 0.509 | 0.001 | 0.485 | -0.103 | 0.488 | -0.225 | 0.493 | 0.057 | 0.560 | 0.190 | 0.606 |
| SFARM | n.a. | 1.370 | n.a. | 1.377 | n.a. | 1.364 | n.a. | 1.518 | 0.374 | 0.617 | 0.266 | 0.825 |
| LEV | 0.017 | 0.202 | -0.041 | 0.211 | -0.028 | 0.210 | -0.052 | 0.220 | -0.825 | 0.008 | | |
| PET | -0.059 | 0.568 | -0.278 | 0.583 | -0.214 | 0.592 | 0.067 | 0.585 | 0.137 | 0.583 | 0.166 | 0.541 |
| AFH | -0.101 | 0.421 | -0.113 | 0.420 | -0.094 | 0.484 | -0.053 | 0.548 | n.a. | 1.201 | 0.248 | 0.294 |
| GAMZA | -0.185 | 0.228 | -0.176 | 0.226 | -0.037 | 0.233 | 0.064 | 0.251 | -0.318 | -0.407 | | |
| ALB | 0.298 | 0.618 | 0.335 | 0.660 | 0.294 | 0.643 | 0.337 | 0.629 | 0.436 | 0.607 | | |
| BHC | 0.390 | 0.310 | 0.426 | 0.321 | 0.398 | 0.305 | 0.377 | 0.301 | 0.148 | 0.293 | -0.021 | 0.240 |
| Sofix | 0.220 | 0.498 | 0.091 | 0.508 | 0.155 | 0.505 | | | | | | |

| | Filter size | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stocks | 0.18 | | 0.2 | | 0.25 | | 0.3 | | 0.4 | | 0.5 | |
| | F | B | F | B | F | B | F | B | F | B | F | B |
| ALBHL | | | | | | | | | | | | |
| IHLBL | | | | | | | | | | | | |
| PETHL | 0.413 | 0.342 | | | | | | | | | | |
| DOVUHL | | | | | | | | | | | | |
| SFARM | 0.143 | 0.833 | 0.338 | 0.827 | -0.593 | 0.798 | 0.434 | 0.787 | -0.016 | 0.940 | 0.249 | -0.249 |
| LEV | | | | | | | | | | | | |
| PET | 0.114 | 0.560 | 0.195 | 0.555 | 0.373 | 0.540 | | | | | | |
| AFH | | | | | | | | | | | | |
| GAMZA | | | | | | | | | | | | |
| ALB | | | | | | | | | | | | |
| BHC | -0.132 | 0.283 | -0.050 | 0.233 | -0.845 | 0.171 | | | | | | |
| Sofix | | | | | | | | | | | | |

Table 10

**ANNUAL RATES OF RETURN BY SECURITY: AVERAGED OVER ALL FILTER VALUES**

| Stocks | Average Return Filter | Average Return Filter (long positions) | Average Return Filter (short positions) | Average Return Buy-and-hold | Profitable Filters | Superior Filters | Active Filters |
|---|---|---|---|---|---|---|---|
| ALBHL | 0.160 | 0.619 | -0.348 | 0.471 | 14 | 1 | 18 |
| IHLBL | -0.107 | 0.489 | -0.867 | 0.691 | 6 | 0 | 17 |
| PETHL | 0.349 | 0.967 | -0.071 | 0.425 | 19 | 4 | 19 |
| DOVUHL | -0.130 | 0.286 | -0.651 | 0.428 | 4 | 0 | 18 |
| SFARM | n.a. | 0.439 | n.a. | 1.067 | 6 | 1 | 24 |
| LEV | -0.262 | -0.132 | -0.483 | 0.180 | 1 | 0 | 17 |
| PET | -0.419 | 0.139 | -1.179 | 0.588 | 6 | 0 | 21 |
| AFH | n.a. | 0.141 | n.a. | 0.439 | 1 | 0 | 18 |
| GAMZA | 0.004 | 0.219 | -0.185 | 0.171 | 10 | 4 | 17 |
| ALB | 0.050 | 0.451 | -0.589 | 0.508 | 8 | 0 | 17 |
| BHC | 0.244 | 0.574 | -0.173 | 0.297 | 17 | 13 | 21 |
| Sofix | 0.066 | 0.391 | -0.536 | 0.432 | 12 | 0 | 15 |
| | | | | Average: | 8.4 | 2.1 | 18.8 |

**Note:** n.a. is used to denote cases where daily return can notbe calculated (it happens when while having a short possition we incur a loss of more than 100 per cent). Averages are calculated excluding the index SOFIX (as it is not tradable directly).

Table 11

## ANNUAL RATES OF RETURN BY FILTER: AVERAGED OVER ALL SECURITIES

**Panel A: no transaction costs**

| | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.005 | 0.01 | 0.015 | 0.02 | 0.025 | 0.03 | 0.035 | 0.04 |
| Average return filter | -0.284 | -0.286 | -0.203 | -0.208 | -0.218 | -0.174 | -0.165 | -0.129 |
| Average return filter (long) | 0.140 | 0.155 | 0.241 | 0.255 | 0.224 | 0.266 | 0.277 | 0.307 |
| Average return filter (short) | -0.641 | -0.641 | -0.572 | -0.590 | -0.586 | -0.554 | -0.541 | -0.543 |
| Average return (buy-and-hold) | 0.452 | 0.452 | 0.457 | 0.459 | 0.459 | 0.458 | 0.457 | 0.458 |
| Profitable securities | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 4 |
| Average number of transactions | 476.8 | 367.0 | 287.4 | 246.6 | 212.9 | 182.3 | 161.5 | 141.2 |

| | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.045 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.1 | 0.12 |
| Average return filter | -0.057 | -0.004 | 0.048 | 0.097 | 0.095 | 0.121 | 0.167 | 0.170 |
| Average return filter (long) | 0.376 | 0.422 | 0.468 | 0.509 | 0.523 | 0.524 | 0.622 | 0.572 |
| Average return filter (short) | -0.488 | -0.453 | -0.393 | -0.353 | -0.418 | -0.488 | -0.466 | -0.542 |
| Average return (buy-and-hold) | 0.473 | 0.484 | 0.480 | 0.487 | 0.534 | 0.566 | 0.597 | 0.670 |
| Profitable securities | 4 | 5 | 5 | 7 | 7 | 7 | 6 | 7 |
| Average number of transactions | 120.1 | 104.7 | 83.1 | 66.7 | 56.8 | 50.8 | 42.5 | 30.6 |

| | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.14 | 0.16 | 0.18 | 0.2 | 0.25 | 0.3 | 0.4 | 0.5 |
| Average return filter | 0.185 | 0.283 | 0.134 | 0.161 | -0.355 | 0.434 | -0.016 | 0.249 |
| Average return filter (long) | 0.412 | 0.652 | 0.538 | 0.496 | 0.122 | 1.159 | 0.783 | |
| Average return filter (short) | -0.421 | -0.447 | -0.611 | -0.642 | -1.561 | -0.374 | -1.200 | 0.249 |
| Average return (buy-and-hold) | 0.564 | 0.534 | 0.505 | 0.538 | 0.503 | 0.787 | 0.940 | -0.249 |
| Profitable securities | 8 | 6 | 3 | 2 | 1 | 1 | | 1 |
| Average number of transactions | 20.7 | 17.1 | 18.0 | 18.0 | 7.3 | 3.0 | 3.0 | 1.0 |

**Panel B: 0.05 per cent transaction costs**

| | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.005 | 0.01 | 0.015 | 0.02 | 0.025 | 0.03 | 0.035 | 0.04 |
| Average return filter | -0.786 | -0.682 | -0.513 | -0.476 | -0.448 | -0.372 | -0.343 | -0.285 |
| Average return filter (long) | -0.594 | -0.441 | -0.214 | -0.141 | -0.112 | -0.016 | 0.018 | 0.083 |
| Average return filter (short) | -0.956 | -0.886 | -0.766 | -0.759 | -0.729 | -0.679 | -0.654 | -0.648 |
| Average return (buy-and-hold) | 0.450 | 0.451 | 0.456 | 0.458 | 0.459 | 0.457 | 0.456 | 0.457 |
| Profitable securities | | | 2 | 2 | 2 | 3 | 3 | 3 |
| Average number of transactions | 476.8 | 367.0 | 287.4 | 246.6 | 212.9 | 182.3 | 161.5 | 141.2 |

(continued)

(continued)

| | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.045 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.1 | 0.12 |
| Average return filter | -0.19 | -0.13 | -0.05 | 0.02 | 0.02 | 0.06 | 0.11 | 0.12 |
| Average return filter (long) | 0.19 | 0.26 | 0.34 | 0.41 | 0.45 | 0.46 | 0.57 | 0.52 |
| Average return filter (short) | -0.58 | -0.54 | -0.46 | -0.41 | -0.47 | -0.54 | -0.52 | -0.59 |
| Average return (buy-and-hold) | 0.47 | 0.48 | 0.48 | 0.49 | 0.53 | 0.57 | 0.60 | 0.67 |
| Profitable securities | 3 | 4 | 4 | 6 | 5 | 6 | 6 | 7 |
| Average number of transactions | 120.1 | 104.7 | 83.1 | 66.7 | 56.8 | 50.8 | 42.5 | 30.6 |

| | Filter size | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.14 | 0.16 | 0.18 | 0.2 | 0.25 | 0.3 | 0.4 | 0.5 |
| Average return filter | 0.144 | 0.245 | 0.102 | 0.133 | -0.392 | 0.418 | -0.036 | 0.236 |
| Average return filter (long) | 0.390 | 0.614 | 0.504 | 0.470 | 0.089 | 1.147 | 0.771 | |
| Average return filter (short) | -0.468 | -0.489 | -0.646 | -0.675 | -1.611 | -0.395 | -1.231 | 0.236 |
| Average return (buy-and-hold) | 0.439 | 0.531 | 0.502 | 0.536 | 0.500 | 0.787 | 0.940 | -0.250 |
| Profitable securities | 8 | 6 | 3 | 2 | 1 | 1 | | 1 |
| Average number of transactions | 20.7 | 17.1 | 18.0 | 18.0 | 7.3 | 3.0 | 3.0 | 1.0 |

## APPENDIX 2

### SAMPLE SELECTION PROCEDURE AND SAMPLE COMPOSITION

At the time when we began selecting our sample of stocks (in November 2006), there were some 314 companies listed for trading on the Bulgarian Stock Exchange and not in the state of bankruptcy or liquidation[24]. Out of these 314 stocks, 202 had been listed for trading before the beginning date of the sample period (October 20, 2000). Potentially, our sample could have included all of these 202 stocks. Unfortunately, most of them were traded only rarely, so they could not provide enough information for the underlying price processes.

In order to solve the problem with the infrequent trading, we estimated and analyzed the fraction of days throughout the sample period, in which there was no trading with each of the 202 individual securities. The problem turned out to be quite severe, so we had to strike a very delicate balance between having enough stocks in our sample and not running into the need to impute too many missing price observations[25]. We tried several thresholds for the fraction of the missing price observations and at the end selected the value of 25 per cent[26]. With this criterion in place, only 11 companies qualified to become part of our sample. The overall number of missing observations for the whole sample stood at 2446, i.e. some 14.6 per cent of the total (see tables A1.1. and A1.2. below for further details).

Table A1.1

**NUMBER OF MISSING VALUES IN THE SAMPLE UNDER DIFFERENT THRESHOLD LEVELS**

| | 5% | 10% | 15% | 20% | 25% | 30% |
|---|---|---|---|---|---|---|
| Before 20.10.2003 | 18 | 246 | 813 | 1033 | 2265 | 2265 |
| After 20.10.2003 | 0 | 7 | 8 | 50 | 181 | 181 |
| Whole sample | 18 | 253 | 821 | 1083 | 2446 | 2446 |
| Number of companies satisfying the criterion | 1 | 3 | 6 | 7 | 11 | 11 |

[24]There were also several companies that were listed for trading on the BSE, but no deal was ever done with their shares. These were also not included in the 314 companies that we used in selecting our final sample.

[25]We realized that imputing missing price observations could distort the underlying price evolution process and in this way introduce bias in the test statistics we calculate.

[26]No individual stock, which was not traded in at least 75 per cent of the trading days on BSE, was eligible to be included in the sample.

Table A1.2

**PERCENTAGE MISSING VALUES IN THE SAMPLE UNDER DIFFERENT THRESHOLD LEVELS**

| | 5% | 10% | 15% | 20% | 25% | 30% |
|---|---|---|---|---|---|---|
| Before 20.10.2003 | 2.4% | 10.9% | 18.1% | 19.7% | 27.5% | 27.5% |
| After 20.10.2003 | 0.0% | 0.3% | 0.2% | 0.9% | 2.1% | 2.1% |
| Whole sample | 1.2% | 5.5% | 9.0% | 10.1% | 14.6% | 14.6% |
| Number of companies satisfying the criterion | 1 | 3 | 6 | 7 | 11 | 11 |

The 11 stocks that met the sample selection criterion are listed in Table A1.3. Most of them belong to the group of the mass (voucher) privatization funds, established in 1996 and later transformed into holding companies, listed on BSE.

Table A1.3

**COMPANIES SELECTED IN THE SAMPLE**

| Ticker | Company name | Industry |
|---|---|---|
| ALBHL | Albena Invest Holding AD-Albena | Holding company (tourism) |
| IHLBL | Industrial Holding Bulgaria PLC-Sofia | Holding company |
| PETHL | Synergon Holding AD-Sofia | Holding company (fuels) |
| DOVUHL | Doverie United Holding PLC-Sofia | Holding company |
| SFARM | Sopharma AD-Sofia | Pharmaceuticals |
| LEV | Zlaten Lev AD-Sofia | Holding company |
| PET | Petrol AD-Sofia | Fuels |
| AFH | Favorit Hold AD-Sofia | Holding company |
| GAMZA | Severcoop Gamza Holding AD-Sofia | Holding company |
| ALB | Albena AD-Albena | Tourism |
| BHC | Bulgarian Holding Company AD-Sofia | Holding company |

After narrowing down the sample to 11 companies, we faced the issue of how to cope with the missing values in order to be able to estimate autocorrelation functions and the other test statistics. We used the following two methods for imputing missing price observations:

1) Method 1: based on the assumption that the price of a stock can change only if a transaction is concluded. Hence, in days when there is no trading with the stock, the price remains the same as its last observed value;

2) Method 2: features linear interpolation of the missing values between any two available price observations;

The second method implies certain assumptions about the price evolution process, which may not be entirely consistent with the efficient markets hypothesis. Yet, we decided to employ this method for reference, i.e. as a way to check to what extent the test statistics that we calculate are sensitive to the method used for imputing missing values.

Besides the 11 individual stocks and the index SOFIX, we included in our sample two portfolios. They were constructed from the 11 stocks in the sample and one of them had equal initial weights, while the other one was weighted on the basis of the market capitalization of the stocks as of October 23, 2000. We did not keep the weights constant throughout the whole sample period. Instead, we fixed them only initially and then allowed them to vary in line with the changes in the prices of the individual securities (see Table A1.4. for the weight values we used). In other words, we formed two portfolios using buy-and-hold strategy and tracked their returns over the sample period.

Table A1.4

**NUMBER OF MISSING OBSERVATIONS BY WEEKDAY**

| Day | ALBHL | IHLBL | PETHL | DOVUHL | SFARM | LEV | PET | AFH | GAMZA | ALB | BHC | Sofix | Total missin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monday | 22 | 51 | 5 | 44 | 65 | 37 | 78 | 68 | 37 | 65 | 84 | 5 | 561 |
| Tuesday | 14 | 32 | 4 | 19 | 60 | 25 | 61 | 55 | 21 | 38 | 69 | 1 | 399 |
| Wednesday | 19 | 48 | 4 | 38 | 60 | 35 | 75 | 77 | 35 | 57 | 68 | 1 | 517 |
| Thursday | 20 | 36 | 2 | 42 | 60 | 34 | 64 | 65 | 25 | 45 | 71 | 3 | 467 |
| Friday | 18 | 49 | 3 | 41 | 56 | 29 | 78 | 60 | 20 | 55 | 70 | 2 | 481 |

Note: the total number of observations in the table does not add to 1525, because there are 16 Saturdays in which BSE had trading sessions.

The returns of the individual stocks were calculated as continuously compounded returns based on closing prices. The returns of the two portfolios, that we constructed, were calculated from the simple returns of the individual stocks, but are themselves continuously compounded. Weekly returns were calculated from Tuesday to Tuesday, as it turned out to be the weekday, with the smallest number of missing price observations (see Table A1.5. for more details). When the closing price in a particular Tuesday was not available, due to the lack of deals in that day, we calculated the return for that week using the closing prices for the next and previous Tuesday and then scaled the return to take into account the fact that it referred to a period longer than one week.

Table A1.5

**MARKET CAPITALIZATION OF THE COMPANIES IN OUR SAMPLE**

| | ALBHL | IHLBL | PETHL | DOVUHL | SFARM | LEV | PET | AFH | GAMZA | ALB |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of shares | 5500000 | 21003235 | 14122649 | 13149848 | 66000000 | 6481959 | 1.09E+08 | 2356923 | 2673899 | 4273126 |
| Price at closing | 1.37 | 0.24 | 1.15 | 0.34 | 0.76 | 2.4 | 0.21 | 0.91 | 1.23 | 5.93 |
| Company capitalization | 7535000 | 5040776 | 16241046 | 4470948 | 50160000 | 15556702 | 22942419 | 2144800 | 3288896 | 25339637 |
| Share | 4.79% | 3.20% | 10.32% | 2.84% | 31.87% | 9.88% | 14.58% | 1.36% | 2.09% | 16.10% |

## APPENDIX 3

### TECHNICAL NOTES ABOUT SOME OF THE TEST STATISTICS EMPLOYED

In this Appendix, we present in detail some of the test statistics, which we use to test the weak-form efficiency of the BSE, and their sampling properties. In doing this, we entirely follow the exposition of Lo and MacKinlay (1988) – the paper where these test statistics were originally presented.

**Autocovariances and Autocorrelations:**

The autocorrelation coefficient is a natural time-series extension of the well-known correlation coefficient between two random variables *x* and *y*.

$$Corr[x, y] = \frac{Cov[x, y]}{\sqrt{Var[x]}\sqrt{Var[y]}}$$

Given a covariance-stationary time series $\{r_t\}$, the *k*-th order autocovariance and autocorrelation coefficients, $\gamma(k)$ and $\rho(k)$, respectively are defined as follows:

$$\gamma(k) \equiv Cov[r_t, r_{t+k}]$$

$$\rho(k) \equiv \frac{Cov[r_t, r_{t+k}]}{\sqrt{Var[r_t]}\sqrt{Var[r_{t+k}]}} = \frac{Cov[r_t, r_{t+k}]}{\sqrt{Var[r_t]}} = \frac{\gamma(k)}{\gamma(0)}$$

Where the second equality in the last equation follows from the covariance-stationarity of $\{r_t\}$. For a given sample, auto covariance and autocorrelation coefficients may be estimated in the natural way by replacing population moments with sample counterparts:

$$\hat{\gamma}(k) = \frac{1}{T}\sum_{t=1}^{T-k}(r_t - \bar{r}_T)(r_{t+k} - \bar{r}_T), 0 \le k < T$$

$$\hat{\rho}(k) = \frac{\hat{\gamma}(k)}{\hat{\gamma}(0)}$$

$$\bar{r}_t \equiv \frac{1}{T}\sum_{t=1}^{T} r_t$$

The sampling theory for $\hat{\rho}(k)$ and $\hat{\gamma}(k)$ depends on the datagenerating process for $\{r_t\}$. For more details, please refer to Campbell, Lo and MacKinlay (1997), Chapter 2.

**Box – Pierce Q-Statistic**

The Box-Pierce (1970) Q-Statistic also known as Portmanteau Statistic is defined as:

$$Q_m \equiv T\sum_{k=1}^{m}\rho^2(k)$$

Under the RW1 null hypothesis, this test statistic is asympothically distributed as $\lambda_m^2$.

**Variance Ratio statistic to test for RW1:**

Let $p_t$ denote the log price process and $r_t \equiv p_t - p_{t-1}$ continuously compounded returns.

The null hypothesis that corresponds to RW1 can be stated as:

$H_0$ : $r_t = \mu + \varepsilon_t,\ \varepsilon_t \sim IIDN(0,\sigma)$

Let our sample consist of $nq + 1$ observations $\{p_0, p_1, \ldots, p_{nq}\}$ where $q$ is any integer greater than one. The following estimators should be defined:

$$\hat{\mu} = \frac{1}{nq}\sum_{k=1}^{nq}(p_k - p_{k-1}) = \frac{1}{nq}(p_{nq} - p_0)$$

$$\hat{\sigma}_a^2 = \frac{1}{nq}\sum_{k=1}^{nq}(p_k - p_{k-1} - \hat{\mu})^2$$

$$\hat{\sigma}_b^2(q) = \frac{1}{nq}\sum_{k=1}^{n}(p_{qk} - p_{qk-q} - q\hat{\mu})^2$$

$$\hat{VR}(q) = \frac{\hat{\sigma}_b^2(q)}{\hat{\sigma}_a^2}$$

In order to improve the finite sample properties of this test statistic, Lo and MacKinlay propose two important refinements. The first is to use overlapping $q$-period returns in estimating the variances by defining the following alternative estimator for $\sigma_2$:

$$\hat{\sigma}_c^2(q) = \frac{1}{nq^2}\sum_{k=q}^{nq}(p_k - p_{k-q} - q\hat{\mu})^2$$

This estimator contains *nq-q+1* terms, whereas the estimator $\hat{\sigma}_b^2(q)$ contains only *n* terms. Using overlapping *q*-period returns yields a more efficient estimator and hence a more powerful test.

The second refinement involves correcting the bias in the variance estimators of $\hat{\sigma}_a^2$ and $\hat{\sigma}_c^2(q)$ before dividing one by the other. Denote the unbiased estimators as $\overline{\sigma}_a^2$ and $\overline{\sigma}_c^2(q)$, where:

$$\overline{\sigma}_a^2 = \frac{1}{nq-1}\sum_{k=1}^{nq}(p_k - p_{k-1} - \hat{\mu})^2$$

$$\overline{\sigma}_c^2(q) = \frac{1}{m}\sum_{k=q}^{nq}(p_k - p_{k-q} - q\hat{\mu})^2$$

$$m \equiv q(nq-q+1)\left(1-\frac{q}{nq}\right)$$

Consequently the test statistic becomes:

$$\overline{VR}(q) = \frac{\overline{\sigma}_c^2(q)}{\overline{\sigma}_a^2}$$

Under the null hypothesis $H_0$, the asymptotic distribution of the variance ratio is given by:

$$\sqrt{nq}(\overline{VR}(q)-1) \overset{a}{\sim} N\left(0, \frac{2(2q-1)(q-1)}{3q}\right)$$

On the basis of this asymptotic distribution, Lo and MacKinlay define the following standardized test statistic:

$$\psi(q) \equiv \sqrt{nq}(\overline{VR}(q)-1)\left(\frac{2(2q-1)(q-1)}{3q}\right)^{-1/2} \overset{a}{\sim} N(0,1)$$

**Variance Ratio statistic to test for RW3**:

The standardized test statistic used under the RW3 null hypothesis is defined as follows:

$$\psi^*(q) = \frac{\sqrt{nq}(\overline{VR}(q)-1)}{\sqrt{\hat{\theta}}} \overset{a}{\sim} N(0,1)$$

Where

$$\hat{\theta}(q) \equiv 4\sum_{k=1}^{q-1}\left(1-\frac{k}{q}\right)^2 \hat{\delta}_k$$

$$\hat{\delta}_k = \frac{nq\sum_{j=k+1}^{nq}(p_j - p_{j-1} - \hat{\mu})^2 (p_{j-k} - p_{j-k-1} + \hat{\mu})^2}{\left[\sum_{j=1}^{nq}(p_j - p_{j-1} - \hat{\mu})^2\right]^2}$$

**Filter rule test procedure:**

Here, we cite the definition of the filter rule test statistic as provided by Fama and Blume (1966), p. 232:

In applying the filter technique, the data determine whether the first position taken will be long or short. With an *x* per cent filter, an initial position is taken as soon as there is an up-move or a down-move (whichever comes first) where the total price change is equal or greater than *x* per cent. The position is assumed to be taken on the first day for which the price change equals or exceeds the *x* per cent limit. Any positions open at the end of the sampling period are disregarded. Thus only completed transactions are included in the calculations.

The closing price on the day a position is opened defines a reference price: a peak in the case of a long transaction and a trough in the case of a short transaction. On each subsequent day it is necessary to check whether the position should be closed, i.e. whether the current price is *x* per cent below the reference (peak) price in a long position or *x* per cent above the reference (trough) price if the open position is short. If the current position is not to be closed, it is then necessary to check whether the reference price must be changed. In a long position this will be necessary when the current price exceeds the reference price so that a new peak has been attained, whereas in a short position a new trough will be defined when the current price is below the reference price. Of course, when the reference price changes all subsequent testing uses the new value as base.

On ex-dividend days the reference price is adjusted by adding back the amount of the dividend. Such an adjustment is necessary in order to insure that the filter will not be triggered simply because the stock's price typically falls on an ex-dividend date. In addition, if a split occurs when a position is open, the price of the security subsequent to the split is adjusted upward by the appropriate factor until the position is closed.

**APPENDIX 4**

## Additional estimation results (data set with linear interpolation)

Table A3.1

**AUTOCORRELATIONS AND BOX-PIERCE Q-STATISTIC FOR DAILY STOCK RETURNS (P-VALUES IN PARENTHESES)**

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *ALBHL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.026 | -0.086 | -0.029 | -0.013 | -0.005 | 6.39 | 9.38 | 13.43 |
| | | | | | | | | (0.172) | (0.311) | (0.338) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.022 | 0.146 | 0.143 | 0.099 | -0.061 | 42.98 | 51.88 | 53.53 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.024 | 0.012 | 0.043 | 0.034 | -0.027 | 6.01 | 13.24 | 16.64 |
| | | | | | | | | (0.198) | (0.104) | (0.164) |
| *IHLBL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.026 | -0.050 | 0.159 | -0.066 | 0.121 | 35.17 | 39.13 | 40.53 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.003 | 0.030 | -0.011 | 0.113 | -0.049 | 0.091 | 18.30 | 39.22 | 51.07 |
| | | | | | | | | (0.001) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.028 | -0.034 | 0.129 | -0.071 | 0.118 | 55.97 | 73.61 | 84.57 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *PETHL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.019 | 0.009 | 0.092 | 0.108 | 0.036 | 16.14 | 23.71 | 24.20 |
| | | | | | | | | (0.003) | (0.003) | (0.019) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.029 | 0.157 | 0.089 | 0.084 | 0.033 | 31.58 | 41.73 | 42.11 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.025 | 0.121 | 0.100 | 0.089 | 0.022 | 50.14 | 68.15 | 68.80 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *DOVUHL* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.032 | -0.032 | -0.101 | -0.020 | 0.043 | 10.14 | 14.50 | 20.64 |
| | | | | | | | | (0.038) | (0.070) | (0.056) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.026 | 0.157 | 0.085 | 0.025 | 0.023 | 25.60 | 28.57 | 31.90 |
| | | | | | | | | (0.000) | (0.000) | (0.001) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.029 | 0.047 | -0.023 | -0.001 | 0.033 | 5.86 | 8.95 | 11.18 |
| | | | | | | | | (0.210) | (0.346) | (0.513) |
| *SFARM* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.040 | 0.227 | 0.154 | 0.086 | -0.022 | 62.18 | 66.47 | 72.17 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.017 | -0.060 | 0.058 | -0.052 | -0.044 | 8.96 | 21.03 | 24.09 |
| | | | | | | | | (0.062) | (0.007) | (0.020) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.031 | 0.183 | 0.139 | 0.065 | -0.025 | 87.59 | 97.41 | 107.27 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *LEV* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.014 | -0.059 | -0.076 | 0.014 | -0.059 | 9.66 | 15.59 | 35.77 |
| | | | | | | | | (0.046) | (0.049) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.014 | -0.246 | 0.064 | -0.040 | 0.044 | 52.95 | 55.13 | 57.22 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.014 | -0.157 | -0.003 | -0.024 | 0.001 | 38.62 | 44.01 | 54.11 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *PET* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.004 | 0.040 | 0.003 | 0.071 | 0.135 | 0.005 | 17.35 | 27.95 | 30.09 |
| | | | | | | | | (0.002) | (0.000) | (0.003) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.000 | 0.027 | -0.184 | -0.014 | -0.010 | -0.026 | 26.97 | 28.77 | 31.57 |
| | | | | | | | | (0.000) | (0.000) | (0.002) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.034 | -0.054 | 0.046 | 0.090 | -0.002 | 20.06 | 30.65 | 31.21 |
| | | | | | | | | (0.000) | (0.000) | (0.002) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *AFH* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.031 | 0.381 | 0.134 | -0.075 | -0.123 | 137.52 | 273.44 | 280.40 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.033 | -0.108 | 0.045 | 0.143 | 0.043 | 27.90 | 38.81 | 46.58 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.032 | 0.119 | 0.087 | 0.042 | -0.033 | 37.77 | 71.47 | 81.25 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *GAMZA* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.000 | 0.030 | -0.091 | -0.027 | -0.040 | -0.066 | 11.23 | 23.41 | 25.25 |
| | | | | | | | | (0.024) | (0.003) | (0.014) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.031 | 0.035 | -0.013 | -0.049 | 0.004 | 3.00 | 9.90 | 12.61 |
| | | | | | | | | (0.558) | (0.272) | (0.398) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.000 | 0.031 | -0.024 | -0.019 | -0.044 | -0.028 | 5.57 | 14.52 | 18.11 |
| | | | | | | | | (0.233) | (0.069) | (0.112) |
| *ALB* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.020 | -0.002 | -0.050 | -0.034 | -0.051 | 4.71 | 7.44 | 15.02 |
| | | | | | | | | (0.318) | (0.490) | (0.240) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.002 | 0.017 | -0.067 | 0.070 | 0.085 | -0.026 | 13.32 | 40.65 | 46.74 |
| | | | | | | | | (0.010) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.019 | -0.030 | 0.003 | 0.019 | -0.040 | 4.43 | 20.90 | 32.51 |
| | | | | | | | | (0.351) | (0.007) | (0.001) |
| *BHC* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.001 | 0.039 | 0.382 | 0.233 | 0.217 | 0.132 | 197.75 | 204.42 | 231.46 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.036 | -0.025 | 0.001 | 0.077 | 0.061 | 8.07 | 9.08 | 17.57 |
| | | | | | | | | (0.089) | (0.336) | (0.129) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.037 | 0.190 | 0.124 | 0.151 | 0.098 | 128.49 | 131.59 | 158.40 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *SOFIX* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.025 | -0.131 | 0.055 | -0.063 | -0.001 | 18.00 | 25.00 | 36.08 |
| | | | | | | | | (0.001) | (0.002) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.009 | 0.202 | 0.103 | -0.004 | 0.055 | 42.12 | 51.94 | 61.89 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.019 | -0.091 | 0.061 | -0.056 | 0.007 | 22.83 | 33.47 | 47.12 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *Equally-weighted portfolio* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.012 | 0.176 | 0.173 | 0.143 | 0.054 | 62.97 | 82.95 | 89.30 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.014 | 0.208 | 0.174 | 0.075 | 0.045 | 62.83 | 84.43 | 84.59 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.001 | 0.013 | 0.194 | 0.173 | 0.103 | 0.048 | 122.60 | 157.30 | 159.07 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *MarketCap-weighted portfolio* | | | | | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.002 | 0.014 | 0.170 | 0.169 | 0.143 | 0.043 | 59.70 | 78.46 | 80.89 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.001 | 0.013 | 0.031 | 0.100 | 0.029 | 0.011 | 9.28 | 21.00 | 21.49 |
| | | | | | | | | (0.054) | (0.007) | (0.044) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.002 | 0.014 | 0.105 | 0.137 | 0.090 | 0.028 | 58.91 | 81.77 | 83.58 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |

**Notes**: Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

Table A3.2

**AUTOCORRELATIONS AND BOX-PIERCE Q-STATISTIC FOR WEEKLY STOCK RETURNS (P-VALUES IN PARENTHESES)**

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| *ALBHL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0013 | 0.0321 | 0.119 | 0.087 | 0.042 | -0.033 | 4.25 | 11.73 | 14.32 |
| | | | | | | | | (0.373) | (0.164) | (0.281) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0010 | 0.0389 | 0.382 | 0.233 | 0.217 | 0.132 | 6.71 | 27.07 | 33.44 |
| | | | | | | | | (0.152) | (0.001) | (0.001) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 9.41 | 31.08 | 36.53 |
| | | | | | | | | (0.052) | (0.000) | (0.000) |
| *IHLBL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 5.44 | 8.03 | 13.47 |
| | | | | | | | | (0.245) | (0.430) | (0.336) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 46.64 | 57.49 | 75.47 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0015 | 0.0130 | 0.194 | 0.173 | 0.103 | 0.048 | 24.68 | 29.03 | 47.08 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *PETHL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.88 | 18.33 | 20.69 |
| | | | | | | | | (0.143) | (0.019) | (0.055) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0008 | 0.0360 | -0.025 | 0.001 | 0.077 | 0.061 | 9.88 | 31.51 | 32.20 |
| | | | | | | | | (0.043) | (0.000) | (0.001) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 16.88 | 38.58 | 39.91 |
| | | | | | | | | (0.002) | (0.000) | (0.000) |
| *DOVUHL* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | -0.0004 | 0.0305 | -0.091 | -0.027 | -0.040 | -0.066 | 5.11 | 7.90 | 9.15 |
| | | | | | | | | (0.276) | (0.444) | (0.690) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.43 | 27.46 | 34.69 |
| | | | | | | | | (0.077) | (0.001) | (0.001) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.83 | 17.48 | 20.92 |
| | | | | | | | | (0.145) | (0.025) | (0.052) |
| *SFARM* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 15.92 | 17.66 | 25.95 |
| | | | | | | | | (0.003) | (0.024) | (0.011) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0009 | 0.0374 | 0.190 | 0.124 | 0.151 | 0.098 | 2.94 | 6.60 | 10.30 |
| | | | | | | | | (0.567) | (0.581) | (0.590) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0019 | 0.0143 | 0.170 | 0.169 | 0.143 | 0.043 | 27.86 | 29.99 | 43.56 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *LEV* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0013 | 0.0315 | 0.035 | -0.013 | -0.049 | 0.004 | 4.30 | 6.43 | 7.21 |
| | | | | | | | | (0.367) | (0.599) | (0.843) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.12 | 8.74 | 9.86 |
| | | | | | | | | (0.087) | (0.364) | (0.628) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 2.16 | 4.23 | 5.70 |
| | | | | | | | | (0.707) | (0.836) | (0.930) |
| *PET* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.90 | 22.22 | 27.00 |
| | | | | | | | | (0.018) | (0.005) | (0.008) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 8.68 | 16.57 | 20.82 |
| | | | | | | | | (0.070) | (0.035) | (0.053) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0011 | 0.0133 | 0.031 | 0.100 | 0.029 | 0.011 | 7.21 | 17.81 | 25.76 |
| | | | | | | | | (0.125) | (0.023) | (0.012) |
| *AFH* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0005 | 0.0310 | -0.024 | -0.019 | -0.044 | -0.028 | 35.80 | 37.97 | 40.90 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0020 | 0.0255 | -0.131 | 0.055 | -0.063 | -0.001 | 28.93 | 40.54 | 47.62 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 20.39 | 27.31 | 32.43 |
| | | | | | | | | (0.000) | (0.001) | (0.001) |
| *GAMZA* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 6.89 | 9.34 | 12.63 |
| | | | | | | | | (0.142) | (0.315) | (0.396) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.45 | 28.05 | 43.77 |
| | | | | | | | | (0.835) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0015 | 0.0138 | 0.105 | 0.137 | 0.090 | 0.028 | 2.78 | 26.32 | 41.58 |
| | | | | | | | | (0.595) | (0.001) | (0.000) |
| *ALB* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.71 | 18.85 | 20.69 |
| | | | | | | | | (0.005) | (0.016) | (0.055) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0012 | 0.0092 | 0.202 | 0.103 | -0.004 | 0.055 | 19.48 | 29.88 | 42.83 |
| | | | | | | | | (0.001) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 10.36 | 17.45 | 25.65 |
| | | | | | | | | (0.035) | (0.026) | (0.012) |
| *BHC* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0019 | 0.0199 | -0.002 | -0.050 | -0.034 | -0.051 | 34.51 | 35.25 | 37.26 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.40 | 20.25 | 24.16 |
| | | | | | | | | (0.494) | (0.009) | (0.019) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 29.77 | 33.51 | 35.04 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *SOFIX* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.32 | 5.37 | 6.26 |
| | | | | | | | | (0.365) | (0.717) | (0.903) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0016 | 0.0190 | -0.091 | 0.061 | -0.056 | 0.007 | 1.96 | 9.63 | 10.88 |
| | | | | | | | | (0.744) | (0.292) | (0.539) |

(continued)

(continued)

| Sample period | Number of obs. | Mean Value | St. Dev. | r1 | r2 | r3 | r4 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 4.88 | 6.09 | 7.43 |
| | | | | | | | | (0.300) | (0.637) | (0.828) |
| *Equally-weighted portfolio* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0015 | 0.0174 | -0.067 | 0.070 | 0.085 | -0.026 | 16.25 | 41.33 | 52.46 |
| | | | | | | | | (0.003) | (0.000) | (0.000) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.29 | 36.53 | 47.52 |
| | | | | | | | | (0.006) | (0.000) | (0.000) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 24.65 | 67.17 | 83.72 |
| | | | | | | | | (0.000) | (0.000) | (0.000) |
| *MarketCap-weighted portfolio* | | | | | | | | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 11.90 | 33.61 | 47.59 |
| | | | | | | | | (0.018) | (0.000) | (0.000) |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 3.05 | 7.84 | 15.71 |
| | | | | | | | | (0.550) | (0.449) | (0.205) |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 14.38 | 34.00 | 50.98 |
| | | | | | | | | (0.006) | (0.000) | (0.000) |

**Notes:** Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

Table A3.3

**VARIANCE RATIOS FOR DAILY STOCK RETURNS (RW1 NULL HYPOTHESIS)**

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *ALBHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.92 | 0.84 | 0.83 | 0.85 | 0.85 |
| | | (-2.29)* | (-2.32)* | (-1.61) | (-1.12) | (-0.96) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.15 | 1.42 | 1.65 | 1.83 | 1.96 |
| | | (4.11)* | (6.27)* | (6.12)* | (6.13)* | (6.08)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.01 | 1.08 | 1.17 | 1.25 | 1.30 |
| | | (0.53) | (1.73) | (2.19)* | (2.57)* | (2.64)* |
| *IHLBL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.95 | 1.02 | 1.18 | 1.25 | 1.26 |
| | | (-1.43) | (0.3) | (1.67) | (1.81) | (1.59) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.98 | 1.05 | 1.31 | 1.58 | 1.80 |
| | | (-0.68) | (0.8) | (2.88)* | (4.34)* | (5.08)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.97 | 1.04 | 1.26 | 1.45 | 1.58 |
| | | (-1.29) | (0.91) | (3.37)* | (4.67)* | (5.15)* |
| *PETHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.99 | 1.12 | 1.34 | 1.44 | 1.49 |
| | | (-0.15) | (1.81) | (3.13)* | (3.23)* | (3.07)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.37 | 1.64 | 1.81 | 1.88 |
| | | (4.37)* | (5.49)* | (6.05)* | (6.04)* | (5.59)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.12 | 1.33 | 1.58 | 1.74 | 1.81 |
| | | (4.77)* | (6.89)* | (7.6)* | (7.72)* | (7.16)* |
| *DOVUHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.97 | 0.84 | 0.76 | 0.67 | 0.66 |
| | | (-0.85) | (-2.35)* | (-2.24)* | (-2.39)* | (-2.13)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.15 | 1.33 | 1.51 | 1.57 | 1.61 |
| | | (4.26)* | (4.98)* | (4.76)* | (4.22)* | (3.86)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.05 | 1.06 | 1.03 | 1.03 |
| | | (1.86) | (1.05) | (0.85) | (0.27) | (0.25) |
| *SFARM* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.23 | 1.55 | 1.72 | 1.87 | 2.07 |
| | | (6.3)* | (8.01)* | (6.7)* | (6.31)* | (6.64)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.94 | 0.95 | 0.90 | 0.98 | 1.03 |
| | | (-1.59) | (-0.74) | (-0.96) | (-0.14) | (0.19) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.18 | 1.45 | 1.58 | 1.71 | 1.88 |
| | | (7.19)* | (9.39)* | (7.7)* | (7.39)* | (7.79)* |
| *LEV* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.94 | 0.85 | 0.78 | 0.71 | 0.66 |
| | | (-1.53) | (-2.2)* | (-2.03)* | (-2.12)* | (-2.11)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.76 | 0.58 | 0.53 | 0.51 | 0.49 |
| | | (-6.81)* | (-6.25)* | (-4.39)* | (-3.64)* | (-3.2)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.84 | 0.75 | 0.71 | 0.66 | 0.64 |
| | | (-6.1)* | (-5.18)* | (-3.88)* | (-3.5)* | (-3.16)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| *PET* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.01 | 1.15 | 1.37 | 1.51 | 1.54 |
| | | (0.16) | (2.22)* | (3.41)* | (3.75)* | (3.33)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.82 | 0.71 | 0.64 | 0.59 | 0.59 |
| | | (-5.06)* | (-4.35)* | (-3.36)* | (-3.03)* | (-2.58)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.95 | 1.01 | 1.14 | 1.23 | 1.25 |
| | | (-2.06)* | (0.29) | (1.91) | (2.4)* | (2.22)* |
| *AFH* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.38 | 1.68 | 1.34 | 0.86 | 0.65 |
| | | (10.5)* | (9.95)* | (3.12)* | (-1.06) | (-2.18)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.89 | 0.96 | 1.18 | 1.39 | 1.62 |
| | | (-2.96)* | (-0.58) | (1.72) | (2.93)* | (3.92)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.12 | 1.29 | 1.25 | 1.14 | 1.17 |
| | | (4.72)* | (6.1)* | (3.3)* | (1.47) | (1.47) |
| *GAMZA* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.91 | 0.82 | 0.73 | 0.67 | 0.67 |
| | | (-2.42)* | (-2.59)* | (-2.53)* | (-2.41)* | (-2.07)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.04 | 1.02 | 1.07 | 1.13 | 1.15 |
| | | (1.06) | (0.34) | (0.7) | (0.95) | (0.92) |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 0.98 | 0.93 | 0.91 | 0.91 | 0.92 |
| | | (-0.88) | (-1.52) | (-1.22) | (-0.94) | (-0.73) |
| *ALB* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.00 | 0.94 | 0.84 | 0.81 | 0.82 |
| | | (0.01) | (-0.95) | (-1.46) | (-1.39) | (-1.1) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.93 | 1.02 | 1.22 | 1.43 | 1.52 |
| | | (-1.84) | (0.28) | (2.09)* | (3.18)* | (3.26)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.97 | 0.97 | 1.00 | 1.08 | 1.13 |
| | | (-1.17) | (-0.65) | (0.06) | (0.85) | (1.11) |
| *BHC* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.38 | 1.91 | 2.48 | 2.63 | 2.51 |
| | | (10.51)* | (13.33)* | (13.67)* | (11.86)* | (9.4)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.98 | 1.01 | 1.13 | 1.15 | 1.16 |
| | | (-0.66) | (0.13) | (1.23) | (1.13) | (1.03) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.19 | 1.49 | 1.86 | 1.96 | 1.91 |
| | | (7.48)* | (10.24)* | (11.38)* | (9.98)* | (8.08)* |
| SOFIX | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.87 | 0.83 | 0.78 | 0.73 | 0.74 |
| | | (-3.51)* | (-2.44)* | (-2.06)* | (-1.98)* | (-1.63) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.41 | 1.65 | 1.83 | 1.88 |
| | | (5.64)* | (6.09)* | (6.13)* | (6.19)* | (5.6)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.91 | 0.90 | 0.88 | 0.85 | 0.86 |
| | | (-3.49)* | (-2.1)* | (-1.63) | (-1.54) | (-1.21) |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.18 | 1.52 | 1.97 | 2.18 | 2.24 |
| | | (4.89)* | (7.58)* | (9)* | (8.61)* | (7.73)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio 2 | 4 | 8 | 12 | 16 |
|---|---|---|---|---|---|---|
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.21 | 1.53 | 1.91 | 2.19 | 2.37 |
| | | (5.86)* | (7.87)* | (8.57)* | (8.8)* | (8.68)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.20 | 1.52 | 1.92 | 2.16 | 2.28 |
| | | (7.64)* | (10.84)* | (12.15)* | (12.03)* | (11.33)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.17 | 1.51 | 1.93 | 2.19 | 2.35 |
| | | (4.72)* | (7.4)* | (8.62)* | (8.66)* | (8.42)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.03 | 1.17 | 1.34 | 1.48 | 1.58 |
| | | (0.92) | (2.47)* | (3.16)* | (3.54)* | (3.66)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.11 | 1.34 | 1.64 | 1.84 | 1.97 |
| | | (4.14)* | (7.17)* | (8.48)* | (8.73)* | (8.59)* |

**Notes:** Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

Table A3.4

## VARIANCE RATIOS FOR WEEKLY STOCK RETURNS (RW1 NULL HYPOTHESIS)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio 2 | 4 | 8 | 12 | 16 |
|---|---|---|---|---|---|---|
| *ALBHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.01 | 1.00 | 1.25 | 1.30 | 1.15 |
| | | (0.07) | (0.01) | (1.02) | (0.98) | (0.42) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.09 | 1.27 | 1.82 | 2.29 | 2.68 |
| | | (1.13) | (1.79) | (3.46)* | (4.34)* | (4.81)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.14 | 1.53 | 1.86 | 2.07 |
| | | (0.85) | (1.27) | (3.13)* | (4.02)* | (4.27)* |
| *IHLBL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.08 | 1.03 | 0.69 | 0.47 | 0.55 |
| | | (0.95) | (0.22) | (-1.26) | (-1.74) | (-1.25) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.41 | 2.02 | 2.87 | 3.58 | 4.30 |
| | | (5.13)* | (6.85)* | (7.93)* | (8.66)* | (9.43)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.25 | 1.54 | 1.88 | 2.16 | 2.55 |
| | | (4.32)* | (5.08)* | (5.21)* | (5.41)* | (6.16)* |
| *PETHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.18 | 1.17 | 1.07 | 0.96 | 0.92 |
| | | (2.15)* | (1.12) | (0.28) | (-0.12) | (-0.23) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.24 | 1.31 | 1.75 | 2.25 | 2.58 |
| | | (2.99)* | (2.1)* | (3.2)* | (4.2)* | (4.52)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.22 | 1.28 | 1.56 | 1.87 | 2.07 |
| | | (3.86)* | (2.64)* | (3.32)* | (4.09)* | (4.25)* |
| *DOVUHL* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.88 | 0.72 | 0.73 | 0.70 | 0.68 |
| | | (-1.44) | (-1.84) | (-1.1) | (-0.98) | (-0.88) |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.29 | 1.88 | 2.38 | 2.78 |
| | | (2.07)* | (1.95) | (3.76)* | (4.64)* | (5.07)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.03 | 1.01 | 1.29 | 1.49 | 1.63 |
| | | (0.51) | (0.05) | (1.73) | (2.29)* | (2.52)* |
| *SFARM* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.09 | 1.39 | 1.84 | 2.22 | 2.42 |
| | | (1.13) | (2.57)* | (3.47)* | (3.98)* | (3.95)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.99 | 1.14 | 1.22 | 1.07 | 0.93 |
| | | (-0.18) | (0.96) | (0.95) | (0.25) | (-0.2) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.08 | 1.35 | 1.73 | 2.00 | 2.08 |
| | | (1.35) | (3.28)* | (4.33)* | (4.65)* | (4.31)* |
| *LEV* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.94 | 0.84 | 0.95 | 0.97 | 0.93 |
| | | (-0.67) | (-1.03) | (-0.2) | (-0.1) | (-0.19) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.83 | 0.70 | 0.55 | 0.53 | 0.49 |
| | | (-2.17)* | (-2.04)* | (-1.92) | (-1.59) | (-1.45) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.93 | 0.85 | 0.85 | 0.80 | 0.73 |
| | | (-1.17) | (-1.4) | (-0.91) | (-0.93) | (-1.08) |
| *PET* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.25 | 1.27 | 1.47 | 1.87 | 2.30 |
| | | (3.1)* | (1.76) | (1.93) | (2.84)* | (3.59)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.80 | 0.72 | 0.70 | 0.63 | 0.59 |
| | | (-2.57)* | (-1.89) | (-1.28) | (-1.25) | (-1.17) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.14 | 1.14 | 1.31 | 1.59 | 1.90 |
| | | (2.44)* | (1.34) | (1.82) | (2.76)* | (3.58)* |
| *AFH* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.89 | 0.46 | 0.26 | 0.10 | 0.09 |
| | | (-1.29) | (-3.55)* | (-3.06)* | (-2.91)* | (-2.54)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.69 | 2.56 | 3.22 | 3.66 |
| | | (2.54)* | (4.62)* | (6.62)* | (7.45)* | (7.6)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.09 | 1.42 | 1.65 | 1.82 |
| | | (0.88) | (0.8) | (2.48)* | (3.03)* | (3.27)* |
| *GAMZA* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.90 | 0.75 | 0.64 | 0.53 | 0.52 |
| | | (-1.2) | (-1.6) | (-1.49) | (-1.52) | (-1.32) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.07 | 1.04 | 1.44 | 1.77 | 2.10 |
| | | (0.84) | (0.28) | (1.86) | (2.57)* | (3.15)* |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 1.00 | 0.92 | 1.09 | 1.23 | 1.39 |
| | | (-0.08) | (-0.75) | (0.53) | (1.06) | (1.54) |
| *ALB* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.80 | 0.71 | 0.89 | 1.08 | 1.26 |
| | | (-2.39)* | (-1.9) | (-0.45) | (0.25) | (0.72) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.34 | 1.48 | 1.90 | 2.19 | 2.52 |
| | | (4.29)* | (3.21)* | (3.83)* | (3.98)* | (4.34)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.03 | 1.03 | 1.28 | 1.46 | 1.68 |
| | | (0.46) | (0.25) | (1.64) | (2.14)* | (2.71)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio 2 | 4 | 8 | 12 | 16 |
|---|---|---|---|---|---|---|
| *BHC* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.29 | 1.20 | 0.77 | 0.56 | 0.59 |
| | | (3.5)* | (1.29) | (-0.93) | (-1.43) | (-1.13) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.11 | 1.20 | 1.55 | 1.91 | 2.24 |
| | | (1.34) | (1.33) | (2.32)* | (3.04)* | (3.53)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.23 | 1.21 | 1.05 | 0.99 | 1.08 |
| | | (3.98)* | (2.01)* | (0.31) | (-0.04) | (0.3) |
| *SOFIX* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.88 | 0.80 | 0.85 | 0.90 | 0.91 |
| | | (-1.46) | (-1.28) | (-0.6) | (-0.32) | (-0.24) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.12 | 1.21 | 1.30 | 1.18 | 1.08 |
| | | (1.5) | (1.43) | (1.25) | (0.59) | (0.23) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.92 | 0.87 | 0.92 | 0.92 | 0.93 |
| | | (-1.44) | (-1.26) | (-0.49) | (-0.37) | (-0.27) |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.32 | 1.46 | 1.86 | 2.50 | 3.07 |
| | | (3.9)* | (3.03)* | (3.54)* | (4.89)* | (5.74)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.24 | 1.52 | 2.26 | 2.86 | 3.35 |
| | | (3.01)* | (3.49)* | (5.34)* | (6.25)* | (6.7)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.26 | 1.47 | 2.04 | 2.57 | 3.03 |
| | | (4.62)* | (4.41)* | (6.14)* | (7.34)* | (8.09)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.27 | 1.49 | 2.02 | 2.77 | 3.37 |
| | | (3.33)* | (3.2)* | (4.21)* | (5.77)* | (6.58)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.07 | 1.24 | 1.58 | 1.78 | 1.99 |
| | | (0.94) | (1.61) | (2.47)* | (2.62)* | (2.84)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.18 | 1.37 | 1.80 | 2.25 | 2.67 |
| | | (3.24)* | (3.47)* | (4.75)* | (5.85)* | (6.67)* |

**Notes:** Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

Table A3.5

## VARIANCE RATIOS FOR DAILY STOCK RETURNS (RW3 NULL HYPOTHESIS)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio 2 | 4 | 8 | 12 | 16 |
|---|---|---|---|---|---|---|
| ALBHL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.91 | 0.83 | 0.81 | 0.82 | 0.81 |
| | | (-1.16) | (-1.24) | (-0.99) | (-0.8) | (-0.77) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.15 | 1.41 | 1.62 | 1.78 | 1.89 |
| | | (2.5)* | (3.57)* | (3.46)* | (3.53)* | (3.56)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.01 | 1.08 | 1.16 | 1.23 | 1.27 |
| | | (0.25) | (0.87) | (1.17) | (1.47) | (1.57) |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| IHLBL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.95 | 1.05 | 1.23 | 1.31 | 1.34 |
| | | (-0.5) | (0.28) | (0.85) | (0.96) | (0.91) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.99 | 1.07 | 1.32 | 1.59 | 1.79 |
| | | (-0.18) | (0.66) | (1.93) | (2.87)* | (3.35)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.97 | 1.04 | 1.25 | 1.45 | 1.58 |
| | | (-0.61) | (0.42) | (1.7) | (2.41)* | (2.72)* |
| PETHL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.01 | 1.16 | 1.38 | 1.53 | 1.61 |
| | | (0.08) | (0.8) | (1.39) | (1.71) | (1.83) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.37 | 1.62 | 1.77 | 1.82 |
| | | (2.5)* | (3.16)* | (3.48)* | (3.53)* | (3.3)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.12 | 1.33 | 1.56 | 1.72 | 1.77 |
| | | (2.16)* | (3.19)* | (3.73)* | (3.97)* | (3.8)* |
| DOVUHL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.97 | 0.84 | 0.76 | 0.66 | 0.64 |
| | | (-0.56) | (-1.53) | (-1.59) | (-1.81) | (-1.69) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.33 | 1.48 | 1.53 | 1.55 |
| | | (2.7)* | (3.22)* | (3.18)* | (2.89)* | (2.71)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.05 | 1.05 | 1.06 | 1.01 | 1.01 |
| | | (1.13) | (0.62) | (0.5) | (0.11) | (0.07) |
| SFARM | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.23 | 1.54 | 1.70 | 1.82 | 2.00 |
| | | (3.38)* | (4.48)* | (3.86)* | (3.69)* | (3.94)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.94 | 0.94 | 0.88 | 0.96 | 1.00 |
| | | (-0.76) | (-0.43) | (-0.61) | (-0.19) | (-0.01) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.18 | 1.44 | 1.57 | 1.69 | 1.85 |
| | | (3.15)* | (4.31)* | (3.68)* | (3.6)* | (3.88)* |
| LEV | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.94 | 0.84 | 0.77 | 0.69 | 0.64 |
| | | (-0.82) | (-1.23) | (-1.24) | (-1.37) | (-1.41) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.75 | 0.67 | 0.65 | 0.63 | 0.62 |
| | | (-2.9)* | (-2.31)* | (-1.92) | (-1.81) | (-1.73) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.84 | 0.75 | 0.70 | 0.66 | 0.63 |
| | | (-2.81)* | (-2.62)* | (-2.28)* | (-2.26)* | (-2.18)* |
| PET | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.00 | 1.14 | 1.34 | 1.47 | 1.48 |
| | | (0.05) | (1.22) | (1.95) | (2.22)* | (2)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.82 | 0.71 | 0.64 | 0.58 | 0.57 |
| | | (-2.7)* | (-2.56)* | (-2.24)* | (-2.18)* | (-1.96)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.95 | 1.01 | 1.14 | 1.21 | 1.23 |
| | | (-1.08) | (0.12) | (1.03) | (1.36) | (1.28) |
| AFH | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.38 | 1.67 | 1.31 | 0.83 | 0.62 |
| | | (1.39) | (1.46) | (0.52) | (-0.25) | (-0.52) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.89 | 0.95 | 1.16 | 1.36 | 1.56 |
| | | (-1.76) | (-0.41) | (0.98) | (1.8) | (2.49)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio 2 | 4 | 8 | 12 | 16 |
|---|---|---|---|---|---|---|
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.12 | 1.29 | 1.24 | 1.12 | 1.14 |
| | | (0.91) | (1.31) | (0.82) | (0.37) | (0.4) |
| GAMZA | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.91 | 0.82 | 0.71 | 0.66 | 0.65 |
| | | (-1.15) | (-1.27) | (-1.36) | (-1.37) | (-1.25) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.04 | 1.02 | 1.06 | 1.10 | 1.10 |
| | | (0.61) | (0.14) | (0.34) | (0.47) | (0.43) |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 0.98 | 0.92 | 0.90 | 0.90 | 0.90 |
| | | (-0.49) | (-0.87) | (-0.76) | (-0.64) | (-0.55) |
| ALB | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.00 | 0.93 | 0.83 | 0.79 | 0.79 |
| | | (-0.02) | (-0.47) | (-0.81) | (-0.85) | (-0.75) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.93 | 1.01 | 1.21 | 1.41 | 1.49 |
| | | (-0.98) | (0.1) | (1.14) | (1.87) | (1.94) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.97 | 0.97 | 1.00 | 1.07 | 1.11 |
| | | (-0.55) | (-0.34) | (-0.02) | (0.4) | (0.56) |
| BHC | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.38 | 1.91 | 2.50 | 2.65 | 2.54 |
| | | (4.36)* | (5.68)* | (6.31)* | (5.71)* | (4.71)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.97 | 1.00 | 1.11 | 1.12 | 1.12 |
| | | (-0.5) | (0.02) | (0.76) | (0.66) | (0.57) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.19 | 1.49 | 1.85 | 1.93 | 1.88 |
| | | (3.64)* | (5.04)* | (5.88)* | (5.3)* | (4.38)* |
| SOFIX | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.87 | 0.83 | 0.78 | 0.73 | 0.73 |
| | | (-1.42) | (-1.2) | (-1.24) | (-1.31) | (-1.16) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.20 | 1.40 | 1.64 | 1.80 | 1.83 |
| | | (3.09)* | (3.57)* | (3.85)* | (3.91)* | (3.52)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.91 | 0.90 | 0.88 | 0.86 | 0.86 |
| | | (-1.11) | (-0.81) | (-0.74) | (-0.77) | (-0.65) |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.18 | 1.51 | 1.94 | 2.12 | 2.16 |
| | | (3.37)* | (5.28)* | (6.2)* | (5.84)* | (5.26)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.21 | 1.52 | 1.89 | 2.14 | 2.30 |
| | | (3.67)* | (5)* | (5.68)* | (6.02)* | (6.04)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.19 | 1.52 | 1.91 | 2.13 | 2.24 |
| | | (4.92)* | (7.08)* | (8.19)* | (8.29)* | (7.98)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.17 | 1.49 | 1.90 | 2.13 | 2.27 |
| | | (3.22)* | (5.26)* | (6.07)* | (6.04)* | (5.93)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.03 | 1.16 | 1.32 | 1.45 | 1.53 |
| | | (0.49) | (1.48) | (2.06)* | (2.38)* | (2.48)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.10 | 1.34 | 1.63 | 1.82 | 1.93 |
| | | (2.57)* | (4.72)* | (5.83)* | (6.12)* | (6.13)* |

**Notes:** Test statistic values in parenthesis.
*indicates significance at 5 per cent level.

Table A3.6

## VARIANCE RATIOS FOR WEEKLY STOCK RETURNS WITH LINEAR INTERPOLATION (RW3 NULL HYPOTHESIS)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| ALBHL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.00 | 0.97 | 1.16 | 1.27 | 1.31 |
| | | (-0.02) | (-0.14) | (0.53) | (0.73) | (0.74) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.08 | 1.23 | 1.68 | 2.04 | 2.28 |
| | | (0.58) | (1.06) | (2.1)* | (2.48)* | (2.56)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.04 | 1.12 | 1.47 | 1.75 | 1.89 |
| | | (0.46) | (0.77) | (2.06)* | (2.58)* | (2.63)* |
| IHLBL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.06 | 1.02 | 0.74 | 0.57 | 0.62 |
| | | (0.55) | (0.09) | (-0.96) | (-1.28) | (-0.96) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.39 | 1.97 | 2.69 | 3.25 | 3.80 |
| | | (2.79)* | (4.01)* | (4.98)* | (5.49)* | (5.89)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.24 | 1.53 | 1.81 | 2.03 | 2.34 |
| | | (2.57)* | (3.34)* | (3.59)* | (3.67)* | (4.06)* |
| PETHL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.21 | 1.31 | 1.16 | 0.96 | 0.87 |
| | | (1.43) | (1.38) | (0.49) | (-0.09) | (-0.27) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.23 | 1.27 | 1.62 | 1.98 | 2.16 |
| | | (1.25) | (0.91) | (1.55) | (1.97)* | (2.01)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.21 | 1.26 | 1.50 | 1.76 | 1.89 |
| | | (1.52) | (1.13) | (1.62) | (1.98)* | (2.01)* |
| DOVUHL | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.91 | 0.72 | 0.69 | 0.64 | 0.61 |
| | | (-0.68) | (-1.21) | (-0.98) | (-0.99) | (-0.99) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.16 | 1.25 | 1.75 | 2.10 | 2.33 |
| | | (1.46) | (1.36) | (2.82)* | (3.25)* | (3.33)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.02 | 0.99 | 1.25 | 1.41 | 1.51 |
| | | (0.29) | (-0.08) | (1.19) | (1.62) | (1.77) |
| SFARM | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.08 | 1.35 | 1.74 | 2.01 | 2.32 |
| | | (0.49) | (1.29) | (1.97)* | (2.37)* | (2.85)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.98 | 1.11 | 1.16 | 1.01 | 0.87 |
| | | (-0.16) | (0.43) | (0.46) | (0.03) | (-0.29) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.07 | 1.33 | 1.69 | 1.92 | 2.18 |
| | | (0.48) | (1.32) | (1.98)* | (2.33)* | (2.74)* |
| LEV | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.93 | 0.83 | 1.00 | 1.09 | 1.10 |
| | | (-0.41) | (-0.57) | (0.01) | (0.19) | (0.2) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.92 | 0.82 | 0.59 | 0.51 | 0.44 |
| | | (-0.78) | (-1.06) | (-1.58) | (-1.59) | (-1.66) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.93 | 0.85 | 0.86 | 0.85 | 0.82 |
| | | (-0.75) | (-0.92) | (-0.57) | (-0.51) | (-0.59) |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| PET | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.24 | 1.22 | 1.34 | 1.63 | 1.93 |
| | | (2.02)* | (1.06) | (1.08) | (1.59) | (2.03)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 0.79 | 0.69 | 0.67 | 0.57 | 0.51 |
| | | (-1.92) | (-1.58) | (-1.12) | (-1.17) | (-1.16) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.13 | 1.12 | 1.26 | 1.49 | 1.74 |
| | | (1.4) | (0.75) | (1.03) | (1.57) | (2.06)* |
| AFH | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.88 | 0.44 | 0.24 | 0.17 | 0.14 |
| | | (-0.76) | (-1.17) | (-1.1) | (-1.08) | (-1.06) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.19 | 1.63 | 2.36 | 2.83 | 3.05 |
| | | (1.46) | (2.55)* | (3.67)* | (4.01)* | (3.88)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.04 | 1.07 | 1.36 | 1.58 | 1.70 |
| | | (0.45) | (0.25) | (0.93) | (1.31) | (1.44) |
| GAMZA | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.89 | 0.74 | 0.59 | 0.46 | 0.43 |
| | | (-0.9) | (-1.3) | (-1.33) | (-1.43) | (-1.34) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.05 | 1.00 | 1.33 | 1.57 | 1.78 |
| | | (0.39) | (0.01) | (0.94) | (1.27) | (1.48) |
| Oct 23, 2000 – Nov 23, 2006 | 776 | 0.99 | 0.90 | 1.05 | 1.15 | 1.27 |
| | | (-0.11) | (-0.61) | (0.19) | (0.49) | (0.75) |
| ALB | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.80 | 0.68 | 0.82 | 0.96 | 1.12 |
| | | (-1.21) | (-1.17) | (-0.49) | (-0.09) | (0.26) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.33 | 1.45 | 1.78 | 1.94 | 2.13 |
| | | (2.3)* | (1.98)* | (2.21)* | (2.1)* | (2.15)* |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.02 | 1.01 | 1.23 | 1.38 | 1.56 |
| | | (0.18) | (0.05) | (0.87) | (1.22) | (1.62) |
| BHC | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.29 | 1.21 | 0.80 | 0.71 | 0.71 |
| | | (2.19)* | (0.87) | (-0.5) | (-0.64) | (-0.6) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.09 | 1.16 | 1.42 | 1.73 | 1.94 |
| | | (0.61) | (0.6) | (1.18) | (1.65) | (1.82) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.22 | 1.19 | 1.01 | 1.00 | 1.03 |
| | | (2.17)* | (1.03) | (0.03) | (-0.01) | (0.09) |
| SOFIX | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 0.87 | 0.78 | 0.79 | 0.81 | 0.83 |
| | | (-1.01) | (-1.1) | (-0.75) | (-0.6) | (-0.47) |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.11 | 1.17 | 1.20 | 1.07 | 0.93 |
| | | (0.98) | (0.87) | (0.68) | (0.18) | (-0.15) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 0.92 | 0.85 | 0.88 | 0.86 | 0.86 |
| | | (-0.81) | (-0.87) | (-0.52) | (-0.49) | (-0.44) |
| *Equally-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.30 | 1.41 | 1.75 | 2.28 | 2.86 |
| | | (2.7)* | (2.09)* | (2.55)* | (3.36)* | (4.18)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.23 | 1.47 | 2.08 | 2.52 | 2.79 |
| | | (1.7) | (2.11)* | (3.32)* | (3.69)* | (3.72)* |

(continued)

(continued)

| Sample period | Number of observations | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|
| | | 2 | 4 | 8 | 12 | 16 |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.26 (2.79)* | 1.44 (2.88)* | 1.96 (4.17)* | 2.41 (4.83)* | 2.78 (5.23)* |
| *MarketCap-weighted portfolio* | | | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 1.26 (2.49)* | 1.44 (2.4)* | 1.92 (3.25)* | 2.53 (4.19)* | 3.17 (5.08)* |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 1.06 (0.6) | 1.20 (1.04) | 1.47 (1.52) | 1.58 (1.49) | 1.67 (1.5) |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 1.18 (2.37)* | 1.35 (2.6)* | 1.75 (3.57)* | 2.14 (4.26)* | 2.55 (4.95)* |

**Notes:** Test statistic values in parenthesis.
* indicates significance at 5 per cent level.

Table A3.7

## SUMMARY OF THE RESULTS FOR AUTOCORRELATION COEFFICIENTS AND BOX-PIERCE, Q-STATISTIC FOR THE DATASET WITH LINEAR INTERPOLATION

**Panel A: Summary of the results related to the autocorrelation coefficients**

| Sample period | ρ1 | ρ2 | ρ3 | ρ4 | ρ1 | ρ2 | ρ3 | ρ4 |
|---|---|---|---|---|---|---|---|---|
| *Number of sign reversals in r across sub-periods* | | | | | *(per cent)* | | | |
| – daily data | 8 | 5 | 7 | 5 | 57.1 | 35.7 | 50 | 35.7 |
| – weekly data | 8 | 5 | 9 | 6 | 57.1 | 35.7 | 64.3 | 42.9 |
| *Number of larger r in the second sub-period as compared to the first one* | | | | | *(per cent)* | | | |
| – daily data | 8 | 4 | 6 | 4 | 57.1 | 28.6 | 429 | 28.6 |
| – weekly data | 7 | 6 | 7 | 5 | 50.0 | 42.9 | 50.0 | 35.7 |

**Panel B: Number of statistically significant Box – Pierce, Q-statistics**

| Sample period | Number of observations | Q4 | Q8 | Q12 | Q4 | Q8 | Q12 |
|---|---|---|---|---|---|---|---|
| *Daily data* | | | | *(per cent)* | | | |
| Oct 23, 2000 – Oct 20, 2003 | 749 | 10 | 10 | 11 | 71.4 | 71.4 | 78.6 |
| Oct 21, 2003 – Nov 23, 2006 | 776 | 11 | 13 | 12 | 78.6 | 92.9 | 85.7 |
| Oct 23, 2000 – Nov 23, 2006 | 1525 | 10 | 12 | 12 | 71.4 | 85.7 | 85.7 |
| *Weekly data* | | | | *(per cent)* | | | |
| Oct 24, 2000 – Oct 21, 2003 | 149 | 8 | 9 | 6 | 57.1 | 64.3 | 42.9 |
| Oct 22, 2003 – Nov 21, 2006 | 158 | 5 | 10 | 10 | 35.7 | 71.4 | 71.4 |
| Oct 24, 2000 – Nov 21, 2006 | 307 | 7 | 10 | 12 | 50.0 | 71.4 | 85.7 |

Table A3.8

## SUMMARY OF THE RESULTS FOR VARIANCE RATIONS UNDER RW1 AND RW3 FOR THE DATASET WITH LINEAR INTERPOLATION

**Panel A: Summary data for the tests of the RW1 null hypothesis**

*Number of times RW1 hypothesis rejected (out of 14 possible cases)*

| Sample period | Number q of base observations aggregated to form variance ratio | | | | | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 4 | 8 | 12 | 16 | 2 | 4 | 8 | 12 | 16 |
| | *daily data* | | | | | *weekly data* | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 8 | 11 | 11 | 10 | 10 | 6 | 4 | 4 | 5 | 5 |
| Oct 21, 2003 – Nov 23, 2006 | 8 | 8 | 10 | 11 | 11 | 8 | 6 | 9 | 10 | 10 |
| Oct 23, 2000 – Nov 23, 2006 | 9 | 8 | 9 | 9 | 9 | 6 | 6 | 7 | 10 | 10 |

*Number of reversals of the value of the VR statistics with respect to 1 across sub-periods*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *daily data* | | | | | *weekly data* | | | | |
| | 10 | 8 | 7 | 8 | 7 | 7 | 6 | 7 | 7 | 8 |

**Panel B: Summary data for the tests of the RW1 null hypothesis**

*Number of times RW3 hypothesis rejected out (of 14 possible cases)*

| Sample period | Number q of base observations aggregated to form variance ratio | | | | | Number q of base observations aggregated to form variance ratio | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 4 | 8 | 12 | 16 | 2 | 4 | 8 | 12 | 16 |
| | *daily data* | | | | | *weekly data* | | | | |
| Oct 23, 2000 – Oct 20, 2003 | 4 | 4 | 4 | 5 | 5 | 4 | 2 | 3 | 3 | 4 |
| Oct 21, 2003 – Nov 23, 2006 | 7 | 7 | 7 | 8 | 9 | 2 | 4 | 6 | 7 | 7 |
| Oct 23, 2000 – Nov 23, 2006 | 6 | 6 | 6 | 7 | 7 | 4 | 3 | 5 | 6 | 7 |

*Number of reversals of the value of the VR statistics with respect to 1 across sub-periods*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *daily data* | | | | | *weekly data* | | | | |
| | 8 | 8 | 7 | 8 | 8 | 8 | 7 | 8 | 9 | 8 |

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DP/72/2009

# Financial Development and Economic Growth in Bulgaria (1991–2006).

## An Econometric Analysis Based on the Logic of the Production Function

Statty Stattev

Abstract. This study explores the interrelationship between economic growth and the banking system development in Bulgaria following the logic of the production function, further enriched with financial development indicators. The study verifies the presence of short-term and long-term (Granger test and Wald test) causality between the dynamics of real economy and that of the banking system, as well as the existence of co-integration dependencies between them (Johansen test). The major transmission mechanisms between the two sectors have been identified and forecasts have been made concerning the way in which financial development and major real factors will affect, and contribute to, economic growth in the future. It has been proven that in the period preceding the currency board mechanism implementation in Bulgaria, the banking system development had an adverse effect on aggregate output dynamics, while international trade played the role of a basic transmission mechanism throughout that period. After mid-1997, the dynamics of lending to the non-governmental sector affected positively the economic growth, whereas the rest of the financial variables had a negative impact on it, with investments becoming a fundamental transmission mechanism channeling the various effects.

Резюме. В настоящата разработка се изследва взаимовръзката между икономическия растеж и развитието на банковата система в България според логиката на производствената функция с добавено финансово развитие. Извършена е проверка за наличие на краткосрочна и дългосрочна причинност (тест на Грейнджър и тест на Валд) между динамиката на реалната икономика и тази на банковата система, както и за присъствието на коинтеграционни зависимости между тях (тест на Йохансон). Идентифицирани са основните трансмисионни механизми между двата сектора и са направени прогнози за начина, по който финансовото развитие и основните реални фактори ще влияят, както и за приноса им за икономическия растеж в бъдеще. Доказано е, че в периода до въвеждането на паричния съвет развитието на банковата система влияе негативно върху динамиката на съвкупното производство и като базисен трансмисионен механизъм служи външната търговия. След средата на 1997 г. динамиката на кредита за неправителствения сектор се отразява благоприятно върху икономическия растеж, докато въздействието на останалите финансови променливи е отрицателно, като инвестициите се превръщат в базисен канал за пренос на различни ефекти.

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# Contents

## 1. Introduction

The processes of transformation sweeping through the countries of Central and Eastern Europe in the 1990s were marked by recessions of various durations and depths, which each of these countries initially suffered. The recessions were followed by positive growth rates attained and maintained by these countries, and in a number of cases these growth rates were even relatively high. Parallel to this, a transition from a semi–monetary to a monetary economy began, coupled with a transition from a single–tier to a two–tier banking system, coupled with the introduction of intensive financial intermediation.

The above developments provoke the striving of economic theory to find answers to questions such as: to what an extent these changes are interconnected, what is the specific type of this interconnection, is there any causality underlying the changes, and what is the direction of this causality. The answer to these questions has been sought out in a number of empirical studies, which, owing to the insufficient duration of the time series they explored, include a variety of statistical populations pertaining to the economies in transition in terms of data input and apply the methods of panel simulation and cross–section data analyses. These methods, however, predetermine the impossibility for employing as broad as possible a scope of comparable indicators concerning the countries' financial development, and hence, this makes it impossible for them to formulate unequivocal conclusions about the specificity of the relationships studied in each individual country.

It is these peculiarities precisely that make this subject matter so topical for Bulgaria. The topicality is further enhanced by the fact that apart from the influence of the typical characteristics accompanying a country's transition from a command to market–oriented economy, the economic development of this country has been under the impact of two different monetary regimes, each of which has affected the real economy and the financial system in a different way.

The majority of econometric studies on Bulgaria held to date by Bulgarian authors or by foreign teams with the participation of Bulgarian researchers focus solely either on economic growth, or on the conduct of the banking system, by applying the analytical methods of dynamic series, panel simulation, or the structural models based on the production function. Economic growth simulation is connected mainly with the names of R. Ranguelova, G. Minasyan, Tzv. Tzalinsky, G. Ganev, etc., whereas econometric techniques for the study of money and monetary policy have been used primarily in the publications of N. Nenovsky, K. Christov, M. Berlemann, M. Mikhailov, and other authors.[1] Individual publications, such as those of N. Nenovsky,

K. Christov, G. Ganev, etc., dwell on the interconnection between money and the real economy, the emphasis being laid on the direction of the impact, the effect of monetary regimes and/or the impact of significant channels.[2] The attention in the analyses of N. Nenovsky, E. Peev, and T. Yalumov has been focused on the interactions between banks and companies in their respective roles of lenders and borrowers.[3] As for the relationship between economic growth and financial development in Bulgaria, thus far it has been studied from an econometric point of view by N. Valev and N. Tassich, who focus their research on how bank lending impacts investments and the economic activity in the real sector of the economy.[4]

It is natural for Bulgaria to be present in a number of econometric studies performed on countries in transition, in which the development of the banking system and the real economy has been approximately described by various indicators based on the employment of different econometric methods, leading consequently to ambiguous results. According to the majority of these studies – such as those of G. Fink, P. Haiss, A. Oks, M. Neimke, D. Jaffee, M. Levonian, etc. – the changes in the sector of banking intermediation have a stimulating effect on the dynamic development of aggregate production.[5] In the opinion of T. Koivu, A. Mehl, A. Winkler, C. Vespro, etc., such a positive impact has not been observed and financial development is a statistically negligible factor or is even adversely connected to economic growth, whereas in the research of G. Fink, P. Haiss, G. Vuksic, A. Akimov, A. Wijeweera, etc., the assessment of the effect depends on the choice of a financial development indicator.[6]

*The goal of the analysis that follows is to study the interconnectedness between economic growth and the development of the banking system in Bulgaria following the logic of the production function by means of:*

*– Verification of the availability of a short-term and long-term causality between them;*

*– An assessment of the presence of a long-term causality and outlining the nature and direction of its effect;*

*– Identification of the fundamental mechanisms of transmission and mapping out forecasts about the type and dynamic development of this causal interconnection in a future period of time.*

In compliance with the intention defined above, the subject matter of this study has been laid down in three sections.

*Section One* makes a review and comments upon the results of tests, which study the stationarity of the time series of the variables employed in the study, and substantiates at the same time the utilization of their first differences. The short-term causality tests have been made following the logic of

the production function, by employing the Pair–wise Granger Causality Test with the successive exclusion of one of the function's arguments. Finally, the same scheme was applied to measure the effect of the successive inclusion of each of the financial variables in the model, whereby the specificity of this variable in the course of the time periods under exploration has respectively been taken into account.

*Sections Two and Three* are devoted to the analysis of the long-term dependencies between the financial and real sectors of the economy, discovered on the basis of Johansen's test based on the production function. By applying Wald's test to the second period subject to research (1997–2006), the existing long-term causalities between the variables have also been outlined. The interpretation of the results obtained emphasizes upon these long-term dependencies precisely, which are simultaneously both short-term and long-term causally interrelated.

The analysis has been differentiated into periods divided by the introduction of the currency board mechanism in the country (i.e. into a pre-currency board period and a post-currency board period) in order to distinguish the particular properties characteristic for each of them, whereby for every of the two individual periods the same logical scheme has been applied. Firstly, a presentation and analysis is made of the unadulterated or "authentic" production function, which makes it possible for us to study the interrelations of economic growth with its major generators in the real economy. Then, the assessments obtained for the various production functions are compared with those obtained through their modification by adding indicators for financial development. What is arrived at in this way are indications about the major transmission mechanisms between the real and financial sectors, which are subsequently subjected to a detailed verification by means of the differences between the coefficients preceding the statistically significant variables, obtained after the successive inclusion and exclusion of each individual factor of production and financial variable. Forecasts concerning the second period are made by means of decomposing the variance and impulse functions, commenting at the same time on what the dynamic development will be of the future contribution of the individual variables and their reaction in the event of expected shocks, which condition different scopes and coverage of the production function itself.

## Choice of variables, stationarity tests, Granger causality test

In order to perform the econometric analysis, only those indicators concerning the two sectors (real and financial) have been selected, for which a sufficiently large number of observations was amassed for a relatively long period of time. Five indicators for the real sector of the economy (Rj) have been arrived at, out of which two are indicators of economic growth and three are real sector production indicators representing investments, labor, and foreign trade.[7] Another seven indicators have been selected for the financial sector, which play the role of independent variables in the econometric models subsequently constructed; and they have been given the indication Fi (i = 1–7).[8] Quarterly data have been used, whereby the seasonal data have been smoothed in advance and brought into a logarithmic form respectively. Two periods, for which quarterly data are available, have been differentiated, namely: from the first quarter of 1991 to the fourth quarter of 1996 (the pre-currency board period), and from the second quarter of 1997 to the third quarter of 2006 (the post-currency board period).

The tests performed for the data series thus created – with few exceptions – make it impossible for the zero hypothesis to be ruled out.[9] Using the test for detecting the presence of a single root, including both information criteria and their modified versions, it turned out that for the first period (1991–1996) there was not a single stationary series among the financial variables. As far as the real economy variables are concerned, they revealed only individual possibilities for rejecting the zero hypothesis. Rather similar are also the results from the tests concerning the next period (1997–2006). Therefore, it would be safe to conclude that in their initial form of constitution the data series are non-stationary and cannot be used for the purposes of econometric modeling.

However, when the first differences between the variables were tested, it turned out that all of them are stationary, i.e. they are devoid of a single root and can correctly be employed for the purposes of econometric analysis (see the results attached in Addendum 1).

What is notable is that over the two periods of time under exploration, however different they are in terms of their financial and economic environment, the data series behaved in a highly similar manner when the tests for the presence of a single root were held. The series are stationary and manifest their stationarity with an absolutely dominant level of statistical significance equal to 1 percent (what should be kept in mind is that the prevailing practice for such studies is to work with a 5 percent risk for error). The slight confusions in individual assessments (according to different criteria), involving the indicators for the number of the employed and consumer prices during the first period, can be explained by the strong and unstable dynamic development of the economy at that time.

In the case under consideration, the two independent tests for the presence of a single root jointly give the same positive assessment for the presence of stationarity observed in the first differences of the variables, given the presence of a long-term constant mean. Moreover, Addendum 1 makes a perfect illustration of the fact that the levels of statistical significance for the two tests are the same with very few exceptions. For its part, this is a prerequisite for a much higher level of security and reliability of the econometric assessments and results, which have been obtained subsequently in the course of performing this study.

Now that it has become clear that the analysis is based on the first differences of the variables, let us see what they are like and what their economic meaning is. In the general case, the first differences (i.e. the differences occurring in two adjacent periods of time) of a given value, expressed in their logarithmic form, mean that the value has increased, because the difference between the logarithms of the two values is a logarithm of the quotient of these same values. Then, for a random indicator Rj or Fi the following equations will be valid:

$$DLGR_{j,t} = LGR_{j,t} - LGR_{j,t-1} = LG\ \frac{R_{j,t}}{R_{j,t-1}}$$

or

$$DLGF_{i,t} = LGF_{i,t} - LGF_{i,t-1} = LG\ \frac{F_{i,t}}{F_{i,t-1}}$$

Because all data series used in the subsequent econometric analysis consist of the first differences of the initially defined variables, they acquire an economic meaning and come to indicate the rate of change of the respective base variable. In this way, the time series used in the econometric simulation and analysis concerning the real and financial sectors of the economy refer to the indicators, which have been conceived as independent variables and are now displayed in Addendum 2.

The results from the stationarity tests are an indispensable step when we attempt to establish causality (or dependency) according to Granger. In this study, when more than two variables are involved, the Pair–wise Granger Causality Test has been applied to the combinations of all possible pairs of variables, which participate in the production function. In practice, this is a test between two variables, but it also takes into account the impact of the rest of the variables in the model in their capacity of hidden variables. This is the way in which the variables participating in the production function have been tested, namely: with and without an indicator or indicators for financial development, and with the successive exclusion of each of the factors of economic growth, namely: investments, labor, and foreign trade.

For the production function constructed in this way, when economic growth (measured by the two indicators – the GDP growth rate and the per capita GDP growth rate) depends only on the above-mentioned three factors, the pair-wise Granger test for the first period fails to indicate any causal dependency between economic growth and any of the factors in both directions (see Addendum 3).

Over the second period under exploration the picture undergoes a substantial change and all factors of production now start to affect economic growth (see Addendum 4). It is only natural that the strongest impact is manifested in the directions from and to investments. The dynamic development of the share of the gross fixed capital formation in terms of the GDP, according to the pair-wise Granger test, is a significant cause for economic growth and at the same time is by itself dependent on both the real GDP growth rate and the per capita real GDP growth rate. Moreover, the afore-mentioned causal interdependence between economic growth and investments is realized at exceptionally good levels of statistical significance, which are far below the 1 percent mark.

The dynamic development of the number of the employed and the share of the foreign trade commodity exchange in terms of the GDP also turn out to be a cause, according to Granger, contributing to the growth rate of the real GDP after the implementation of the currency board mechanism in the country, but now the levels of statistical significance are not as good and hover around the 10 percent mark.

All seven financial variables have been successively included in the complete version of the model (see Addenda 7 and 8). What has been observed for the first period after such an inclusion is two double mutual causalities, according to the Granger test. The first of these causalities confirms the results obtained and quoted above about the interdependence between economic growth (made explicit by means of the two indicators employed) and the first two of the financial indicators. On the one hand, it turns out that the growth rates of the real GDP and the per capita GDP are interdependent according to the Granger test with the rate at which the share of quasi-money changes in terms of the GDP and the share of the M2 monetary aggregate changes in terms of the GDP. On the other hand, this confirms the results already obtained that before the introduction of the currency board mechanism, the links between the real economy and the financial sector fail to pass through the transmission mechanism of investments, and inasmuch as such links or channels exist they are mutually dependent (for half of the financial indicators these links are two-way in fact).

With respect the second causality, the place of growth is now taken by foreign trade. Therefore, the mutual intermediation between growth and finance

for the 1991–1996 period of time is effected predominantly through the channels of foreign trade. This generally means that money "goes round" along the channels of foreign trade commodity exchange, but in the majority of cases this money is not ploughed back as investments for further production.

As far as this first pre-currency board period is concerned, a confirmation was made of Granger's proven unilateral "inverse" dependence of lending extended by the banking system on economic growth. This can mean two things: on the one hand, a substantial part of the loans granted to the real economy enterprises do not become production investments, and, on the other hand, the major part of investment resources (predominantly in the private sector of the real economy) is not funded by means of bank loans.

The analyzed 1991–1996 period of time also yields an unexpected causality in the direction of the country's financial development as a whole, with respect to the growth rate of the employed in the national economy, the only exception being the share of the M2 monetary aggregate in terms of the GDP. The explanation of this phenomenon can be sought out along the line of the fact that a large portion of the financial resources during this period goes to maintaining the employment rate of an unjustifiably high, inefficient and ineffective labor force, which, at the same time, is paid for by relatively low wages. On the whole, however, this is considered to be a quasi-causality, for which a logical explanation cannot be found, and could therefore be neglected as a meaningful economic result.[10]

Interesting results have been obtained after the successive exclusion of each of the factors of production from the model. In all versions of a given factor exclusion, Granger's unilateral causality has been preserved in the direction from economic growth to the shares of overall lending (or total credit) and the non-governmental lending in terms of GDP at the same levels of statistical significance of around 5 percent on the average. This means that this is a stable dependency and that it is not affected either by any of the factors of economic growth, or by any combination of theirs.

The observed two-way causality between the factors of economic growth and the shares of quasi-money in terms of the GDP and the M2 monetary aggregate in terms of the GDP becomes a one-way causality – from financial development to economic growth only – when any one of the growth factors is excluded from the model. In the opposite direction, this Granger's interdependency grows considerably weaker and remains in force depending only on the relation of the per capita real GDP growth rate to the share of quasi-money in terms of the GDP (if the factors of labor and foreign trade are excluded), and on the per capita real GDP growth rate to the share of the M2 monetary aggregate in terms of the GDP (when investments have been excluded).

The reported Granger quasi-causality from financial development to the labor factor of production is now manifested for a smaller part of the financial sector indicators applied in the study. When the factors of *investments* and *foreign trade* are excluded, what affects the employment growth rate is only the share of the domestic financial assets and the share of the total financial assets in terms of the GDP, and this effect is revealed at substantially deteriorated levels of statistical significance hovering around the 10 percent mark. Taking also into account that these results are valid only for the most broadly defined indicators concerning the depth of banking intermediation, which do not directly correspond with the performance of the major financial functions, the results can be taken to be negligible from the point of view of their substance and meaning.

During the second period of time, the direct Granger causality disappears in the direction from financial development to economic growth, and at the same time the causality in the opposite direction is enhanced in comparison with the preceding period. The real GDP growth rate and the per capita real GDP growth rate turn out to be significant causes for the overall development of the financial system according to five out of the seven indicators employed in the study (the two exceptions being only the share of quasi-money in terms of the GDP and the share of the M2 monetary aggregate in terms of the GDP). The sharp increase of the impact exerted by investments has also been confirmed, alongside the confirmation of their performance in the capacity of a transmission mechanism, which is characteristic for five of the financial indicators with the exception of the share of domestic lending in terms of the GDP and the share of domestic assets in terms of the GDP. The mutual Granger causality is observed between the growth rate of the gross fixed capital formation in terms of the GDP and the dynamic development of non-governmental lending in terms of the GDP, which can be accepted as a positive testimony for the development of the country's macro–economy as a whole.

Extremely strong and with a shifted weight center (in comparison with the preceding period) is the Granger interdependency between foreign trade and financial development. The rate of change in the share of the foreign trade commodity exchange is a significant Granger cause (measured at very good levels of statistical significance much below the 1 percent mark) for six of out the seven financial indicators (the only exception being the share of quasi-money in terms of the GDP). The interdependency is expressed by the fact that in the opposite direction financial development is a Granger cause for four out of the six indicators, namely: the share of quasi-money in terms of the GDP, the share of liquid liabilities in terms of the GDP, the share of non-governmental lending in terms of the GDP, and the share of total bank assets in terms of the GDP. In this way foreign trade also turns out to be a transmission mechanism between the real economy and the financial system.

For the period after 1997 (the post–currency board period) we register once again the same quasi-causality in the direction from financial development to the labor factor of production for four of the financial indicators: share of domestic lending and share of non-governmental lending in terms of the GDP, as well as for the share domestic assets and share of the total banking assets in terms of the GDP, whereby for the indicator share of loans for the non-governmental sector in terms of the GDP there is a mutual causality, i.e. an inverse Granger causality indicating a dependency on the dynamic development of the number of the employed or the employment rate. In fact, there is a single possible logical explanation about the relationships between the labor factor of production and financial development. Inasmuch as the Bulgarian economy is developing predominantly in an extensive fashion, we can assume that a certain portion of domestic loans and the loans extended to the non-governmental sector are spent on hiring additional work force. And as this study makes use of the indicator employment growth rate, to a certain extent it is normal for the above commented Granger causalities and mutual causalities to exist in practice (and they do at very good levels of statistical significance at that).

With the successive exclusion of each of the factors of production from the model, what is observed in the second period of time (1997–2006) is an exceptional stability in the mutual dependencies, which have already been proven, among all variables treated simultaneously and successively in the capacity of both dependent and independent variables. In all variants of exclusion of one of the factors of production, the assessments commented above have been preserved – both with respect to the F–statistics assessments and those of the statistical probability (significance), which indicates that the Granger dependencies and mutual dependencies in the period after the implementation of the currency board mechanism are very resilient and stable.

The search for long-term dependencies is based on the presence or absence of co-integration between the various independent variables, because such co-integration underlies the long-term equilibrium in the system subject to the study. In fact, the tests of Dicky–Fuller and Phillips–Peron described above, and all the rest of the stationarity tests, as well as a number of residual–based methods (such as the method of the least squares, for instance)[11], also assess co-integration, but in these cases each equation is assessed *per se* – on its own only. In this study, however, the attention is focused on the verification of co-integration in systems of equations. In other words, what has been sought out in this study are long-term systemic dependencies between different dimensions of financial and economic development.

The check-up for the presence of multiple co-integration is held by means of Johansen's test, which is traditionally employed to this purpose.[12] Four types of models have been successively tested, which differ one from another by the level of differences we have determined to work with – respectively zero, first or second difference. The models also differ by the presence or absence of a free member of the equation. The choice of models for further analysis observes the requirements for the lowest values of the information criteria and the best statistical probability.

Johansen's test assumes and verifies the existence of a correlation in the system, i.e. the existence of at least one long-term dependency. Then, by iteration, the existence of at least two, three, etc., long-term dependencies are assumed and verified (in connection with the variables included in the model, and until their number has been fully depleted). Thus in practice, the verification is carried out in parallel for each two of the mutually related criteria. The first one follows up and determines the number of co-integration vectors, while the second criterion tests the zero hypothesis for the absence of co-integration vectors. If the zero hypothesis has been rejected, the next zero hypothesis is automatically tested for the presence of at least one long-term dependency, then it is tested for the presence of at least two such dependencies, etc.

According to the result obtained from Johansen's test, in each individual case we obtained as many long-term dependencies (co-integration equations) as are the variables included in the model from zero to their actual number. Provided we work with the first differences of each of the variables, which have the meaning of growth rates, at the time of performing Johansen's test all time series were tested at the same time lag (0, 0). The purpose was to assess each co-integration equation, so that a comprehensive and meaningful VAR construction could be arrived at, which is actually a vector auto–regressive model of corrected error (Vector Error Correction Model – VECM).

The vector auto–regressive models, which represent a summary of regular auto–regressive models, are applicable and suitable in cases such as this study, when the independent variables are more than two.[13] The serious advantage of the VAR models in comparison with the other models and simulated constructions is that they do not require any preliminary definition of the variables as a *priori* endogenous or exogenous. Here all variables are presumed to be regarded as endogenous and are defined by means of the given model. The models employed predominantly in this study are of the type mentioned above – VECM, which have been specifically constructed to work with co-integrated time series (and the empirical analysis in *Section Two* proves to operate with such co-integrated time series precisely).

Upon the construction of the VEC models specifically employed in the study, a number of particularities had to be taken in consideration. First, it is

mandatory that one of the variables should always be either the GDP or the per capita GDP, i.e. Y or YC. Second, the presence of one to three out of the seven chosen variables, describing financial development Fi, is also mandatory. Third, one to three out of the remaining five variables, describing economic development Rj, (because the symbols Y and YC have already been reserved) shall always be included. Under these conditions, the specific VEC model employed is described by a system of equations, looking pretty much like the one illustrated below, where $ECT_{t-1}$ is an error correction member with one lag in time[14], which is the same for all equations. In the normal case, $ECT_{t-1}$ inclines to zero, which means that the system is in a state of equilibrium, or a state close to equilibrium, e.g.:

$$DLGY_t(YC_t) = a_1 + a_{1,1}ECT_{t-1} + \sum_{k=1}^{n} b_{1,k} DLGY_{t-k}(YC_{t-k}) + \sum_{k=1}^{n} c_{1,k} DLGF_{i,t-k} + \sum_{k=1}^{n} h_{1,k} DLGR_{j,t-k} + e_{1,t}$$

$$DLGF_{i,t} = a_2 + a_{2,1}ECT_{t-1} + \sum_{k=1}^{n} b_{2,k} DLGY_{t-k}(YC_{t-k}) + \sum_{k=1}^{n} c_{2,k} DLGF_{i,t-k} + \sum_{k=1}^{n} h_{2,k} DLGR_{j,t-k} + e_{2,t}$$

$$DLGR_{j,t} = a_3 + a_{3,1}ECT_{t-1} + \sum_{k=1}^{n} b_{3,k} DLGY_{t-k}(YC_{t-k}) + \sum_{k=1}^{n} c_{3,k} DLGF_{i,t-k} + \sum_{k=1}^{n} h_{3,k} DLGR_{j,t-k} + e_{3,t}$$

The major factor contributing to the choice of VEC models as an instrument for analysis is the understanding that they simulate the long-term equilibrium of the system subject to this study. This is done by introducing into the analysis past presumed equilibriums in the capacity of factors determining the current state and the future development of the variables under consideration.

Upon the practical implementation of the summarized VEC model described above, which has been constructed on the logical basis of the production function, several successive stages have to be covered. At each stage we obtain various measurement tools and the general model acquires further specificities. In this way, within the framework of the VEC methodology employed in this study, we create different variants of production functions with the participation of the three real variables (or factors) mentioned above: $R_3$ – IY, $R_4$ – LF, and $R_5$ – XY, employing on top of them the already known financial variables (or factors).[15] Following this logic we verify to what an extent each of these factors plays the role of a transmission mechanism between the real economy and the financial sector.

What is exploited at the beginning is the well–known formal logic from the second stage, and the independent variables are grouped in threes, whereby the first one is an indicator for economic growth: $R_1$ – Y or $R_2$ – YC; the second variable takes all the forms of an indicator for the development of the banking sector Fi (i = 1, 2, 3, 4, 5, 6, 7); and the third and fourth variables are all possible pairs of combinations of Rj (j = 3, 4, 6). This is how three com-

binations have been arrived at, from which a successive exclusion is made of $R_3$ – IY, $R_4$ – LF, and $R_5$ – XY.

Each of the above combinations is computed with each of the financial variables (indicated here as the second variable) and in this way seven systems of four equations each have been generated. The specific model can be visualized in the following way as a system of equations (1):

$$Y(YC) = F_1 (Rq, Rs, Fi),\ q, s = 3, 4, 6;\ qs;\ i = 1, 2, 3, 4, 5, 6, 7 \quad (1)$$

This is how – only with respect to the GDP growth rate ($R_1$ – Y) – three pairs of real independent variables are obtained, each of which has seven combinations with one financial independent variable. Another seven are the existing combinations with respect to the per capita GDP growth rate ($R_2$ – YC). In the last version of the extended production function employed, the latter includes the three real independent variables simultaneously ($R_3$ – IY, $R_4$ – LF, and $R_5$ – XY), which – together with the financial variable Fi (i = 1, 2, 3, 4, 5, 6, 7), are presented as four factors (or sources) of economic growth. The production function in this case is formulated by means of the following equation (2):

$$Y(YC) = F_2 (IY, LF, XY, Fi),\ i = 1, 2, 3, 4, 5, 6, 7. \quad (2)$$

Parallel to this, a similar production function is constructed, which refers to the real sector of the economy only. With an exclude financial independent variable, the production function is formulated by means of equation (3), which is of the following type:

$$Y(YC) = F_3 (IY, LF, XY) \quad (3)$$

The last two systems of equations (2) and (3) are of a great methodological significance for the specific econometric analysis, because they contain a piece of serious cognitive meaning from a comparative point of view. If we compare them to the preceding set of equations, postulated by the system of equations (1), they are more comprehensive and complete, i.e. they each contain an additional variable (either financial or real) than the preceding equations, from which this variable has been excluded.

Upon performing the empirical comparative analysis in the following two sections of the study, this construction makes it possible to establish what is the independent role and impact of each of the independent real and financial variables on economic growth, i.e. what is the contribution made by each of these variables to the development of the real sector of the economy (and to economic growth in particular), and also what is the contribution of a specific variable in the interactions between the financial sector and the real economy, as well as its contribution to the development of the financial sector itself.

In all the cases subject to this study, for which Johansen's test has been performed and a VEC model has been constructed, a long-term Granger causality (VEC Granger Causality) has been sought out. This search was performed by means of the complex exogenous Wald test (Block Exogeneity Wald Test). For the purposes of the econometric analysis in this study, when the long-term Granger causality was researched, a modified Wald test was implemented in the way proposed by Toda and Yamamoto.[16] In this test, each of the variables of a given econometric equation, which are usually presumed to be endogenous, is treated as an exogenous variable, while at the same time all the rest of the variables remain endogenous by default. In this way, through such a modified Wald test, for each of the equations in the given VRC model we obtain as many blocks (or groups) of assessments as the number of the variables in the model are. In each of the groups one of the variables is taken to be exogenous, and it is in terms of this variable that the assessments of the Chi-square statistics are made, which shows the effect of each one of the remaining variables in this equation (accepted to be endogenous by default) on the selected exogenous (or dependent) variable in the given block, as well as the statistical significance of this effect. Parallel to this, at the end of each block, a general assessment of the Chi-square statistics is made on the complex joint impact of all variables treated as endogenous on the variable chosen to be exogenous, as well as an assessment of its statistical significance.

When the existence of long-term dependencies has been found, it is by means of the above mentioned variances and modifications of the Granger tests that it becomes possible to define for which of the long-term dependencies there is a short-term causality, and for which the causality is a long-term one, as well as for which of the dependencies such causality is simultaneously both a short-term and long-term Granger causality.

The VAR (VEC) methodology, which has been employed in this study, can be used for prognostic purposes as well. This is the intent and design of two of the major functions[17] built in the EVIEWS software package, which are used precisely to this end. These two functions are: the variance decomposition function and the impulse function, which is also known as the impulse response function. The variance decomposition function outlines the effect of each of the independent variables on each and every of the remaining independent variables employed in the model subject to the study, as well as its autonomous effect upon itself at various points of a future period of time. In this way, what we expect to see in the future behavior of the system is the subsiding impact of some of the variables and the growing impact of other variables, which will be taking place at various rates in the course of their dynamic development.

In this study, the independent variables have been filtered in compliance with the methodology of Cholesky, without the presence of any standard errors. When testing the econometric model on the basis of combined graph analysis, we established that the decomposed impact of the different variables stabilizes on the whole approximately at the time of the twentieth time lag, i.e. after a five years' period of time. This is the reason why the variance decomposition has been made for 4, 12, and 20 lags respectively in the tables summarizing the empirical results, which can be seen in the attached Addenda. This is how empirical information is obtained about the future factor effect of the chosen variables for periods of time after one, three, and five years respectively. From a methodological point of view, this approach is completely justified, because the forecast refers to a period of time, which is of a duration equal to half the length of the ten years' period of time subject to analysis (i.e. the entire period after the implementation of the currency board mechanism), and this has been a common practice when similar studies are held.

In each specific model, the variance decomposition of individual variables is expressed in percentage terms, whereby the sum total of all factors (i.e. variables) is always 100 per cent. In this way the variance decomposition for each variable yields valuable information about its relative significance with respect to all the variables making up the system for various future periods of time.

The impulse functions (or else: the impulse response functions) indicate the future shock effect on a given independent variable in relation to each of the remaining independent variables included in the model. Therefore, the impulse function expresses the one–way impact between any two variables within the system, whereas the variance decomposition considers the comprehensive effect of a given variable on the entire system, i.e. on all variables, including the effect it produces on itself as well. The very impulse response or shock within the system is defined as a modification of the size of a standard deviation. In practice, this is the way of assessing the various shocks within the system, and some of them are defined as relatively strong, whereas others are assessed as relatively weak. From the point of view of the behavior of shocks in the course of time, we can say that they subside in different manners: some die out very rapidly, whereas others retain their impact for a much longer period of time.

On the basis of the tests held on the impulse response functions stemming from the models constructed under this study, we can say that the shocks on the whole subside fairly rapidly – at the rate of 10 to 12 time lags. This is the reason why the empirical information obtained in connection with the impulse responses and revealed in the respective tables in the Addenda, attached hereto, covers periods of one, two, and three years ahead. In a num-

ber of cases, especially when the number of the variables in the systems of equations increases, the shocks continue to subside even after the third year and this can take as long as the fifth year. These specific cases have been subject to separate analyses, and it to this effect precisely that the study contains an additional graphic representation of their behavior.

Another particularity can be said to be the fact that Cholesky's methodology, employed in this study, automatically assumes that individual shocks do not correlate among themselves, which is far from a realistic assumption. Because the effect of these correlations cannot be separated, it is usually attributed to the first variable in the model (i.e. in the system of equations), which varies in each individual case. Moreover, the places of the equations in the model change in practice, so that each individual variable (standing for a given factor) is at least once postulated as a first variable and takes this effect upon itself. The same result is obtained when the variance is decomposed, whereby the first variable always has the greatest contribution (usually over 50 percent, and in individual cases its contribution can go as high as 95 percent).

The last problem, which the econometric analysis had to solve, is connected with outlining and assessing the mechanisms of transmission (the channels of impact and interaction) between the real economy and the financial system. From a methodological point of view, the solution to the problem thus defined is sought out by means of the appropriate grouping and comparison of the models already constructed. To this end, a system has been constructed, which is a combination of the systems of equations already constructed (1), (2), and (3), which we have put down in a certain order. The new system (4) looks as follows:

$$\begin{aligned} &Y\,(YC) = F_2\,(IY, LF, XY, F_i),\ i = 1, 2, 3, 4, 5, 6, 7. \\ &Y\,(YC) = F_3\,(IY, LF, XY) \\ &Y\,(YC) = F_1\,(Rq, Rs, F_i),\ q, s = 3, 4\ , 6;\ qs;\ i = 1, 2, 3, 4, 5, 6, 7. \end{aligned} \qquad (4)$$

The system presented in this way makes it possible for us to perform specific comparisons by including and excluding various real and financial variables into and from the model. By means of this inclusion and exclusion we verify the role and significance of each of the independent variables, studied in the model, in their capacity of a factor of interaction between financial and economic development. The specific research method built on the basis of the above stated model can be logically followed up in the following manner:

Let q = 4 and s = 5. Then system (4) acquires the following expression:

$$\begin{aligned} &(YC) = F_2\,(IY, LF, XY, F_i),\ i = 1, 2, 3, 4, 5, 6, 7. \\ &Y\,(YC) = F_3\,(IY, LF, XY) \\ &Y\,(YC) = F_1\,(LF, XY, F_i),\ i = 1, 2, 3, 4, 5, 6, 7, \end{aligned} \qquad (5)$$

where a real variable, which has been excluded from the third (last) equa-

tion or the $F_1$ function, stands for the relative share of the gross fixed capital formation in terms of the GDP ($R_3$ = IY).

In the same way, if $q$ = 3 and $s$ = 5, the system acquires the following look (6):

$$Y\,(YC) = F_2\,(IY, LF, XY, F_i),\ i = 1, 2, 3, 4, 5, 6, 7.$$
$$Y\,(YC) = F_3\,(IY, LF, XY) \qquad (6)$$
$$Y\,(YC) = F_1\,(IY, XY, F_i),\ i = 1, 2, 3, 4, 5, 6, 7,$$

where the excluded real variable from the third equation is the number of the employed($R_4$ = LF).

And lastly, if $q$ = 3 and $s$ = 4, what follows is the exclusion of the third real variable employed – the relative share of foreign trade commodity exchange in terms of the GDP ($R_5$ = XY) from the third equation. This is how system (7) has been obtained:

$$Y\,(YC) = F_2\,(IY, LF, XY, F_i),\ i = 1, 2, 3, 4, 5, 6, 7.$$
$$Y\,(YC) = F_3\,(IY, LF, XY) \qquad (7)$$
$$Y\,(YC) = F_1\,(IY, LF, F_i),\ i = 1, 2, 3, 4, 5, 6, 7.$$

Thus, each of the three last systems of equation, which we have specified in concrete terms, namely (5), (6) u (7), differs from the others by the exclusion of one real variable and consequently by the inclusion of two real variables, represented by the variances in the third equation and the $F_1$ function. By means of the second equation or the $F_3$ function we now have as a basis for comparison a constant classical production function concerning an open economy with factors of production such as capital, labor, and foreign trade. On the other hand, by means of the first and third equation or the $F_2$ and $F_1$ functions, we provide for the successive inclusion of each of the seven financial variables: $F_i$, (i = 1, 2, 3, 4, 5, 6, 7) one by one.

The essence of the methodology employed in this study, which is both a factor analysis methodology and one for registering and assessment of the transmission mechanisms between financial and economic development, consists in the comparison of the free members and coefficients preceding the independent variables in each of the equations describing the model. With the successive inclusion and exclusion of a given real and financial variable, the coefficients preceding the rest of the variables and the free member of the respective function also change. On the basis of the dynamic development and size of these differences, we can deduce whether a factor effect and a respective transmission mechanism are present, and consequently infer what is their strength and impact.

If we trace the logic of arranging the equations in the overall system (4) and its subsequent three concretizations (5), (6) and (7), we can see that the successive steps look as follows: First we obtain the above mentioned differ-

ences in the coefficients and the free member for the first two equations of the systems under consideration, i.e. functions $F_2$ u $F_3$, which in fact have been derived earlier from equations (2) and (3). These differences give us the quantitative assessment of the contribution, which each of the financial variables makes to economic growth.

What we assess at the next stage are the differences between the free members and the coefficients preceding the independent variables for the first and third equations of the systems considered in this study, represented by functions $F_2$ and $F_1$, which are now familiar as equations (2) and (1). It is on the basis of their dynamic development that we are capable of determining the significance of foreign trade and of assessing its effect and contribution, as well as the significance, effect and contribution of each of the financial variables for the economic growth attained by the country.

What the last stage of the analysis under consideration undertakes is to make a comment on the differences in the coefficients between the second and third equation of the systems constructed in this section of the study, stemming either from the $F_3$ and $F_1$ functions or expressed by equations (3) and (1). Their values make it possible for us to make a judgment about the relations between financial and economic development, by means of comparing the open economy without a financial system described by equation (3) and the closed economy with a financial system provisionally expressed by equation (1). This enables us to assess the contribution both of foreign trade and each of the financial variables, both in their capacity of growth factors and possible transmission mechanisms between the real economy and the financial system.

The methodology established in this study to the purpose of performing factor analysis and seeking out the transmission mechanisms between economic and financial development has been employed in the concrete empirical analysis performed in the next two sections of this study.

The results obtained in the course of performing the Granger causality tests, which have been presented in Section One of this Chapter, create sufficient grounds for us to exploit them in the further analysis of the interrelation between financial development and economic growth (or the so-called Finance–Growth Nexus) within the framework of the theoretical model presented above, which has been constructed following the logic of the production function. As this analysis becomes multi-dimensional and multi-faceted due to the successive inclusion and exclusion of each of the independent variables concerning the real economy and the financial development of the country in order to make a comparison between them, in the subsequent sections of the study this analysis is performed independently for each of the two periods of time, which have been delimited at the beginning of the study.

## An analysis of production functions with the inclusion of a financial variable for the 1991–1996 period of time

The performance of Johansen's co-integration test for the first period subject to this study indicated the presence of long-term dependencies both in the authentic production function (including nothing else but the factors of labor, capital, and foreign trade) and a production function with included financial variable of the share of domestic lending in terms of the GDP at the standard level of statistical significance of 5 percent (see Addendum 5 for further detail). When the statistical significance was lowered to the admissible level of 10 percent, the presence of co-integration dependencies was also revealed upon the inclusion of other three financial indicators in the production function. These indicators are: the share of liquid liabilities in terms of the GDP, the share of non-governmental lending in terms of the GDP, and the share of domestic financial assets in terms of the GDP. In this way, for five out of eight possible combinations we obtained confirmation for the presence of a long-term dependency in the production functions relative to the growth rate of the real GDP. Absolutely the same result has been obtained when economic growth is measured through the second indicator – the per capita real GDP growth rate.[18]

The co-integration equations, which give expression of the above mentioned long-term dependencies, are marked by criss–cross shading in columns (1) and (2) of Addenda 10–15. What is remarkable about these equations is that the following regularity is revealed without any exception whatsoever: The rates of changes in the level of employment and the share of the gross fixed capital formation in terms of the GDP are statistically insignificant, with respective positive and negative signs of their preceding coefficients, whereas the changes in the share of foreign trade commodity exchange in terms of the GDP are statistically significant and have a negative effect. Therefore, the openness of the Bulgarian economy is manifested as the only determinant of economic growth among all real variables, whereby what corresponds to each percent of growth of the openness of the economy is between a 0.33 per cent and 0.52 per cent decline of economic growth (measured both by the growth rate of the real GDP and the per capita growth rate of the real GDP), which reaches 0.59 per cent for the authentic production function.

With the successive inclusion of the financial variables one by one, what can be seen in the logic of their structuring in the groups of liquidity – lending – assets[19] is that all financial variables have a negative sign each preceding their coefficients and that with the only exception of the dynamic development of the share of non-governmental lending in terms of the GDP they

all are statistically significant. This means that the rising level of bank intermediation during the 1991–1996 period of time not only fails to stimulate economic growth, but it also definitely contains it, i.e. it has a restraining effect on economic growth.

Out of the statistically significant financial variables, the effect of the share of domestic bank or financial assets in terms of the GDP is the strongest, and its rise by 1 percent leads to an economic growth decline by 0.51 per cent. A 1 percent change in the share of liquid liabilities in terms of the GDP leads to an inverse change of economic growth by 0.47 per cent. The effect of the share of domestic lending relative to the GDP is of the weakest effect and a 1 percent growth of domestic lending results in an economic growth decline by 0.43 per cent. The statistical insignificance of the coefficient before the variable for non-government lending indicates that economic growth remains relatively unaffected by the variations in the activity of the banking system.

What is notable in the equations analyzed thus far is the following fact: Regardless of the fact which of the two indicators employed in the study are used to the purpose of explicating economic growth, the results obtained both about the statistical significance and the sings preceding the coefficients of each of the independent variables are absolutely identical, whereby even the values of the coefficients are the same up to the third sign after the decimal point.

When the above model is further tested by the successive exclusion of each of the independent variables referring to the real economy in the following order: investments – labor – foreign trade, we obtain an empirical explanation of their corresponding systems of equations (5), (6) u (7), which have already been formulated in the preceding section.[20] The difference in the statistically significant coefficients with an included and excluded real independent variable and the changes, which this difference undergoes, makes it possible for us also to assess the role of the respective factor of growth in its capacity of a transmission mechanism between financial development and economic growth.

In more concrete terms, the analysis referring to the testing of all independent variables in their capacity of possible transmission mechanisms consists in the following. In each of the tables in Addenda 8 – 13 (covering the first pre-currency board period of time) and those in Addenda 15– 20 (covering the second post-currency board period of time), column (0) displays the free member of the equation of the production function and the specific independent variables chosen to participate in it. Then the heading "Co-integration equations" follows and column (1) underneath contains the coefficients standing in front of the free member and the variables when the "complete" production function is considered, having been equipped with the three produc-

tion factors of the real economy plus a given financial variable. Column (2) displays the coefficients of the "authentic" production function, where the financial sector does not participate. The last column (3) underneath the heading displays the coefficients of the production function now containing a financial variable, from which one of the factors of production has been excluded. The last heading "Difference in the coefficients" successively displays the differences in the coefficients from the preceding columns (1), (2) and (3), which are explicitly marked as respective differences.

The differences between the coefficients obtained in column (1 – 3) express the changes that have taken place in the role and contribution of the various independent variables upon the exclusion of one of the growth factors. If the compared coefficients are positive and the change for a given independent variable has a positive sign, this means that when the respective factor is included or taken into account, the impact of the variable is increasing, and vice versa: if the change for a given independent variable has a negative sign, its effect is weakening.

The opposite happens if the coefficients are negative. Then the positive differences indicate that upon the inclusion of a given factor of production, the effect of the variable shrinks, and when the differences are negative, then the impact of the variable rises. In column (1 – 3) an excluded variable is naturally preceded by its actual contribution in the form of a difference and this contribution is set and established by means of the coefficient in front of the variable in the complete production function.

This is the reason why, if the sum total of the changes of all the rest of the coefficients, which have preserved their statistical significance, is smaller than this particular coefficient, it turns out that the respective factor plays a strong role in its capacity of a transmission mechanism. And vice versa, if the sum total of the differences obtained in the rest of the statistically significant coefficients is larger than the coefficient under consideration, this means that the particular factor of production is a weak transmission mechanism, because its role is taken up and enhanced by the other independent variables. And last but not least, the relative size of the changes in the respective coefficients makes it possible for us to make conclusions concerning the strength of the effect, which their defining variables possess.

Similar to the analytical algorithm discussed above, the differences in the coefficients displayed in column (1 – 2) give information about the direction and strength of the impact exerted by the individual financial variables, which we have included in the production function. Because the difference in the coefficients preceding the independent variables in the complete production function with the inclusion (column 1) and exclusion (column 2) of a financial variable is invariant, i.e. it does not depend on the inclusion or exclusion of

the various growth factors, the values in column (1 – 2) are the same for each individual period of time.

The last column (2 – 3) has a complex and summarizing analytical meaning, because from a formal algebraic point of view the values it contains are actually differences from the differences already assessed in columns (1 – 3) and (1 – 2), as by virtue of formal logic it follows that:

(1 – 3) – (1 – 2) = 1 – 3 – 1 + 2 = 2 – 3.

(where the numbers 1, 2, and 3 are the designations of the respective columns in the table).

In this way, the value of the difference between the differences in this last column yields evaluating information about the direction, size, and strength of the effect possessed by the various independent variables upon the simultaneous inclusion of one independent variable from the real economy, and the exclusion of an independent variable pertaining to financial development.

The subsequent analysis first discusses the contribution of the various financial variables to the dependence of economic growth on its major factors, as far as the first period subject to consideration in this study is concerned. Then a separate comment is made of the contribution made by each of the real economy independent variables – investments, labor, and foreign trade, as well as the possible role of this independent variable in the capacity of a transmission mechanism. It is in this sense that the subsequent analysis also makes an interpretation of the differences in the statistically significant coefficients (marked by underlining) of the statistically significant long-term dependencies, the equations of which have been criss–crossed in the tables mentioned above (see the Addenda to the study).

During the first (pre-currency board) period, financial variables as a rule are always negative and smaller than one, i.e. with each 1 percent of change in any of the financial variables we observe a corresponding change of the economic growth rate in the opposite direction, irrespective of the type of production factor combinations, in which these financial variables participate. In three of the equations, the financial indicators are statistically negligible: these are the cases in which the share of quasi-money in terms of the GDP participates, and the same refers to the participation of the M2 monetary aggregate in terms of the GDP and the share of total financial assets in terms of the GDP. In the remaining four cases, the financial variables are statistically significant (see the last row of each segment of column (1)) in each of the Addenda from 8 to 13, which cover the 1991–1996 period of time.

The results from comparing the coefficients upon exclusion of the financial variable, displayed in column (1 – 2) show that the inclusion of any of the seven financial variables in all cases leads to a decline of the absolute value of

the effect foreign trade has. In fact, in the specific situation this means a bigger or smaller restraint or abatement (which however is significant by all means) of the strongly negative impact exerted in principle by the share of the foreign trade commodity exchange relative to the GDP, which stands at -0.6 per cent (or at 0.5952 per cent to be more precise).

The contribution of the various financial indicators to curbing the negative impact of foreign trade throughout the pre-currency board period of time is different for the statistically significant and the statistically negligible variables: it is bigger for the former and smaller for the latter respectively. As far as the statistically significant variables are concerned, the picture is as follows: The dynamic development of the share of liquid liabilities in terms of the GDP leads to one of the largest reductions of its effect – by as much as 0.24 percentage points, which lowers its effect down to -0.36 per cent respectively. The participation of the indicator standing for the share of domestic lending in terms of the GDP diminishes the impact under consideration from -0.60 per cent to -0.44 per cent, or by 0.16 percentage points accordingly. The effect of the dynamic development of the share of private lending in terms of the GDP, for its part, provokes the decrease of the negative impact exerted by foreign trade from -0.60 per cent to -0.52 per cent, or by 0.08 percentage points altogether. The alterations brought about by the changes in the share of domestic financial assets in terms of the GDP lead to the largest curtailment of the negative impact exerted by the dynamic development of the share of the foreign trade commodity exchange in terms of the GDP – by more than 0.26 percentage points (from -0.595 per cent to -0.334 per cent) in comparison with the rest of the financial variables.

The situation is similar with the statistically insignificant financial indicators. Upon the inclusion of the indicators standing for the share of quasi-money in terms of the GDP and the share of the M2 monetary aggregate in terms of the GDP, the constraint on the negative impact of foreign trade is the smallest – by 0.06 percentage points u 0.07 percentage points respectively, dropping to -0.54 per cent and -0.53 per cent accordingly. The last of the financial indicators – the dynamic development of the share of total financial assets in terms of the GDP – also leads to the reduction of the negative impact exerted by foreign trade by 0.20 percentage points, thus diminishing it by one third: from -0.60 per cent to -0.40 per cent.

The second growth factor – labor – is represented by the number of the employed and has a statistically negligible negative effect on economic growth in the standard production function. This statistical insignificance is also preserved when we include any of the various financial variables, i.e. in all variants of the modified production functions with included financial development, subject to this study.

The last growth factor considered in this study – investments, represented by the dynamic development of the share of the gross fixed capital formation in terms of the GDP, is also statistically negligible over the period of time under observation. At the same time, investments are the only independent variable, which has a positive sign in front of its coefficient in all formulated variants of production functions.

Having followed up the impact exerted by the various financial variables on the dependency of economic growth on its different factors (during the period under consideration only in the case with the openness of the economy as the only statistically significant factor), the analysis continues with deliberating the role, which investments, labor, and foreign trade (treated as independent variables) have and play both among themselves and with respect to each of the financial variables from the point of view of their contribution to the economic growth rate.

When we attempt to assess the role of investments, it is necessary to compare the underlined statistically significant coefficients in front of the independent variables in the equations from Addenda 8 and 11, where the statistically significant equations (or dependencies) have been duly criss–crossed in the respective tables.

In the three pairs of analyzed production function equations with an included financial variable with and without investments (see the corresponding criss–crossed equations in columns (1) and (3) in Addenda 8 and 11), investments are statistically insignificant, and the sign preceding them is positive. At the same time, labor is also statistically insignificant, but the sign preceding it is negative, and foreign trade and all financial variables – with the exception of the share of non-governmental lending in terms of the GDP in the absence of investments – are statistically significant, whereby their contribution to economic growth is negative. By comparing the results between columns (1) and (3), it becomes clear that when investments are included, the labor factor of production preserves its statistical insignificance an all three long-term dependencies (see the assessments in column (1 – 3)). What is observed here is a slight decline of the absolute value of the coefficients preceding the statistically significant financial variables – both the share of domestic lending in terms of the GDP (by 0.006 percentage points) and the share of domestic financial assets in terms of the GDP (by 0.001 percentage points). The underlying meaning is that the inclusion of investments results in a slight curtailment of the negative effect these variables have on the dynamic development of the real GDP and the real per capita GDP.

As far as the foreign trade factor is concerned, what is observed in all three cases is an enhancement of the negative effect within the range of 0.03 percentage points to 0.05 percentage points. The latter result can be taken to

prove the fact that a substantial part of all investments made throughout the 1991–1996 period of time has been channeled to industries and enterprises manufacturing products, which provide non-competitive and ineffective exports of labor– and energy–intensive industrial output.

The simultaneous assessment of the inclusion of investments in the production function and the successive exclusion of the financial indicators enhance and multiply the effect of their presence (see the values of the differences between the coefficients displayed in the last column (2 – 3) and compare them with those already analyzed in the preceding two columns). It is natural for this particular set–up to take into account the impact of investments and the financial variables up to its full size, whereby in the latter case this impact has the opposite sign. In this variance we obtain the strongest reduction of the negative effect played by the foreign trade factor, which shrinks more than two times for the share of domestic financial assets in terms of the GDP – by 0.31 percentage points (or else from -0.60 per cent to -0.29 per cent). At the same time, the decline of this negative impact upon the exclusion of the effect of the share of domestic lending in terms of the GDP is to the tune of from -0.60 per cent to -0.41 per cent, or by 0.19 percentage points, and when the dynamic development of the share of private lending in terms of the GDP is eliminated, the negative effect under consideration is reduced by 0.13 percentage points to -0.47 per cent. As for the labor factor of production, it remains statistically insignificant in all three variants mentioned above.

Upon performing the analysis with the excluded labor factor of production at the beginning of this *Section*, it has already been proven that all eight possible long-term dependencies actually exist. The comparison of the coefficients preceding them and of their common dependencies has been made in Addenda 9 and 12 respectively, which are yet to be analyzed. On the whole, the inclusion of the dynamic development of the number of the employed fails to affect in any substantial way the contribution of the rest of the production function independent variables, because in column (1 – 3) of the tables mentioned above, it is the negative differences that reign supreme. Irrespective of the presence or absence of the labor factor of production in a given equation, as a rule the share of the gross fixed capital formation in terms of the GDP, the share of quasi-money in terms of the GDP, the share of the M2 monetary aggregate in terms of the GDP, the share of non-governmental lending in terms of the GDP, and the share of the total financial assets in terms of the GDP, are all statistically insignificant.

The impact of the inclusion of the labor factor of production has an absolutely unequivocal effect on investments and in all cases leads to a slight decline of the positive influence they have on economic growth to the tune of half to one percent.

The effect of the statistically insignificant financial indicators on foreign trade (upon taking into consideration the dynamic development of the share of quasi-money in terms of the GDP, the share of the M2 monetary aggregate in terms of the GDP, and the share of the non-governmental lending in terms of the GDP) is expressed by the symbolic enhancement of its strongly negative impact in the first case and its relatively slight decline in the latter two cases. In three out of the four cases (with the participation of the share of liquid liabilities in terms of the GDP and the shares of domestic and total financial assets in terms of the GDP), the statistically significant financial indicators reveal a prevailing behavior and impact, i.e. they lead to the enhancement of the negative impact exerted by foreign trade, because the coefficients preceding the negative change in the openness of the economy increase their absolute values. For the last statistically significant financial variable – the share of domestic lending in terms of the GDP – the effect tends to be a very slight reduction of the negative effect played by foreign trade. The size of these changes, however, is symbolic in quantitative terms and amounts to no more than a hundredth of one percent.

The impact of the inclusion of the labor factor of production on the negative contribution, which the financial variables make in principle, in terms of direction is also multifarious. Whereas the effect of the dynamic development of domestic lending in terms of the GDP on economic growth is enhanced in its absolute value, i.e. it increases its negative impact, what is observed relative to the remaining three statistically significant financial variables is a reduction of the negative effect. The changes here, however, once again fail to exceed a few hundredths of a percent. As a whole, the effect of the labor factor of production can be assessed as negligible, because its inclusion results in changes close to zero (of the order of hundredths or tenths of a percent) in the impact of the rest of the financial variables on economic growth.

With the simultaneous inclusion of the labor factor of production and the exclusion of the various financial variables, investments continue to be statistically insignificant, while the changes in the contribution of foreign trade are favorable. The coefficients preceding the dynamic development of the share of the foreign trade commodity exchange diminish in absolute terms, but the intensity of this decline varies when we take into account the differences in the financial indicators (see the differences in column (2 – 3) of the tables mentioned above).

Thus for instance, upon excluding the dynamic development of the share of quasi-money in terms of the GDP, of the share of the M2 monetary aggregate in terms of the GDP, and of the share of non-governmental lending in terms of the GDP, the enhanced negative contribution of the openness of the

economy to economic growth is within the limits of 0.06 per cent and 0.08 per cent. Upon eliminating the rest of the financial development indicators, however, it turns out that when we take into account the labor factor of production, this diminishes the contribution of the dynamic development of the share of foreign trade commodity exchange in terms of the GDP to economic growth by a much higher level – from 0.16 per cent to 0.26 per cent.

With the exclusion of the factor foreign trade we have already proven the presence of five long-term dependencies (without those, in which the share of quasi-money in terms of the GDP and the share of the M2 monetary aggregate in terms of the GDP participate in the capacity of independent financial variables), the co-integration equations of which have been criss–crossed, and their respective coefficients and their differences are displayed in the criss–crossed sections of Addenda 10 and 13. On the whole, the exclusion of the foreign trade factor of production (which by itself is the only statistically significant factor from the real economy, exerting at the same time a strongly negative impact on economic growth) in principle does not alter the prevailing statistical insignificance of the rest of the independent real variables of the production function on economic growth.

The only exception is made by the dynamic development of investments in the equation where the relative share of liquid liabilities in terms of the GDP participates, and the dependent variable is the real GDP growth rate, which becomes statistically significant but has a negative sign of the coefficient preceding it. As for the financial variables, statistically significant variables become the share of liquid liabilities in terms of the GDP and the share of non-governmental lending in terms of the GDP, their impact being to enhance the negative contribution with respect to economic growth in its two dimensions.

The inclusion of the factor under consideration here (i.e. foreign trade) also leads to the decline of the absolute values of the negative coefficients preceding all seven of the financial variables from the long-term dependencies affecting economic growth (see columns (1) and (3) respectively). In this case, however, because of the strongly negative basic effect of the financial variables, the positive impact of foreign trade only succeeds to mitigate it to a certain extent, and the result is negative again but its size is reduced. The said reduction is the biggest in the equation, in which the total financial assets participate (by 0.25 percentage points). With respect to the dynamic development of the domestic financial assets and the liquid liabilities, the reduction is by 0.24 percentage points each, and as far as the changes in domestic lending are concerned, this reduction is by 0.18 percentage points.

As for the dynamic development of the share of the M2 monetary aggregate in terms of the GDP and the share of non-governmental lending in terms of the GDP, the inclusion of foreign trade turns them into statistically insignificant variables and reduces their negative contribution to economic growth by 0.17 percentage points and 0.20 percentage points respectively. The last financial indicator – the share of quasi-money in terms of the GDP – remains statistically insignificant, whereby the reduction brought about by its contribution is the smallest – 0.16 percentage points.

The inclusion of the foreign trade factor of production also results in the absolute enhancement (in all seven cases) of the contribution of the share of the gross fixed capital formation in terms of the GDP to economic growth by 0.08 per cent to 0.20 per cent. In practice, the latter transforms the negative contribution of investments (upon the exclusion of the foreign trade factor) into positive (when the openness of the economy is taken into account), but these factors remain statistically insignificant in all possible cases. Taking into account the openness of the economy leads to the enhancement of the negative contribution of the labor factor of production to economic growth in five of the cases. The negative contribution is the largest – by 0.1 percentage points – with the participation of the share of non-governmental (private) lending in terms of the GDP, whereas with the participation of the share of the M2 monetary aggregate in terms of the GDP and the share of domestic financial assets in terms of the GDP this negative contribution is ten times smaller. What is observed for the remaining two financial indicators – the share of the quasi-money in terms of the GDP and the share of domestic lending in terms of the GDP – is a symbolic increase of the negative contribution of the labor factor of production to economic growth: in the latter case by 0.01 percentage points, and in the former case – by 0.001 percentage points.

The comprehensive analysis of the simultaneous inclusion of foreign trade and the exclusion of each of the financial variables, participating in the dependencies subject to analysis, leads to conclusions, which do not contradict the findings already made above. What is particular in this case is that due to the fact that the changes in foreign trade and the financial development are the only statistically significant independent variables in the production functions, the differences in their coefficients coincide with their own coefficients (see the quantitative characteristics of the differences in the coefficients in columns (1 – 2) and (2 – 3) respectively).

In this way, on the basis of the empirical results demonstrated above, we can outline the role of the openness of the economy as a channel conducive to materializing effects in the direction from financial development to economic growth. A testimony to this is the considerable shrinkage of its own

negative impact on the changes taking place with respect to both the real GDP and the per capita real GDP, which can be observed upon the inclusion of any of the financial variables in the production function. Having done this, the statistical significance or insignificance of the different financial variables, when they jointly participate in the model with the dynamic development of the share of the foreign trade commodity exchange in terms of the GDP, also gives certain indications about the availability of working transmission mechanisms. Thus for instance, the statistical insignificance of the changes in the share of quasi-money in terms of the GDP, in the share of the M2 monetary aggregate in terms of the GDP, and in the share of the lending extended to the non-governmental sector of the economy in terms of the GDP, in the presence of the operating foreign trade channel can be interpreted as a proof of the fact that the manifestation of the impact of financial development on economic growth to a large extent goes through this channel precisely.

On the contrary, although for the period under consideration the analysis failed to confirm the role of investments in the capacity of a traditional transmission mechanism (which thus far has been the generally accepted belief), the statistical significance of the rest of the financial indicators is also a symptom revealing the existence of a certain transmission channel of factor productivity (via the productivity of the factors of production). The negative signs preceding the respective variables in such a case indicate that most probably the changes in the size of banking intermediation throughout the period under consideration have a negative connection with factor productivity.

## Long-term dependencies, causalities, and a prognostic analysis of production functions for the 1997–2006 period of time

Johansen's tests for the existence of co-integration dependencies have been tested in all versions arrived at in the process of structuring the production functions, with included or excluded independent variables concerning both the real economy and the country's financial development. The results obtained prove the existence of all possible long-term dependencies throughout the second (post–currency board) period, whereby these results are far below the standard level of statistical significance of 5 per cent (the highest statistical probabilities are of the order of tenths of a percent, and in the usual case – hundredths of a percent) [21]

Irrespective of the fact which of the two economic growth indicators, introduced in this study, perform the role of an independent variable – whether it be the real GDP growth rate, or the per capita real GDP growth rate – the

econometric results along all directions of the study are identical in practice. In the few cases when a difference occurs in the statistical significance with respect to the real GDP growth rate, on the one hand, and with respect to the per capita real GDP growth rate, on the other, and significant quantitative differences emerge in the coefficients preceding their respective variables, a special comment is offered and an analysis is made to this effect.

The co-integration equations, which reproduce the above mentioned long-term dependencies, are displayed in columns (1) u (2) of the respective tables in Addenda 15 to 20. What is remarkable about these equations is that – as an absolute rule, without a single exception – the following dependencies have been manifested:

First: the coefficients preceding the factor of ***investments*** are always and invariably statistically significant, with a positive sign, and as a rule – they are of comparatively high values;

Second: the factor of ***labor*** in the majority of combinations is insignificant, but in the cases where investments have been excluded (and it is then that the labor factor becomes statistically significant), its impact is also positive and of a relatively high value;

Third: ***foreign trade*** is usually statistically insignificant, but in the rare cases of its being statistically significant, the coefficients preceding the share of foreign trade commodity exchange in terms of the GDP have widely disparate values and signs, which depends on the nature of the respective financial variable taking part in the combination;

Fourth: The financial variables in a little more than half of the cases are statistically significant, whereby the coefficients preceding them change their signs and magnitude depending on the specific combination, in which they participate in the production function.

Upon exploring the complete production function with the participation of the three independent variables from the real economy plus a financial variable, the factors of labor and foreign trade are entirely statistically insignificant when economic growth is explicated through the real GDP growth rate. If we substitute the latter with the per capita real GDP growth rate, we obtain statistical significance for foreign trade in the combinations with the share of domestic lending in terms of the GDP and with the share of non-governmental lending in terms of the GDP. As far as the labor factor is concerned, statistical significance for it is obtained only when the share of the total financial assets in terms of the GDP participates in the combination.

The statistically significant coefficients preceding investments vary depending on the group to which the financial variable, included in the production function, belongs. Their values are comparatively more moderate when a

variable from the "liquidity" group participates in the combination – from 0.15 to 0.39, and are markedly higher when an indicator from the groups "lending" and "assets" is included – between 0.41 and 0.58. As far as the financial variables are concerned, what prevails are the negative signs of the coefficients, the only exception being the share of non-governmental lending in terms of the GDP, the coefficient of which is positive, but of a relatively low absolute value. This positive contribution of the growth of lending for the non-governmental (i.e. private) sector confirms the conclusion already made about the stimulating impact of the changes in the banking system activity on economic growth.

Wald's test for the Granger long-term causality gives only one strong two–way causal dependency, which has been confirmed in all the cases of the complete production function, and this is the dependency between economic growth and investments. The only absence of such a dependency is observed solely with the share of non-governmental lending in terms of the GDP, when economic growth is explicated by the per capita real GDP growth rate, and only in the direction from growth to investments. In other words, in this case the dependency remains one–way: from investments to economic growth only.

For the labor factor, such a two–way long-term causality exists in six out of the eight variants of the complete production function (explored for each one of the two indicators for economic growth separately). Causality between labor and economic growth in the direction from the dynamic development of the number of the employed to the economic growth rate has not been observed only in two cases: in the "pure" production function and when the financial variable of the share of non-governmental lending in terms of the GDP has been included in it.

The results confirm the absence of any long-term dependency whatsoever between foreign trade and economic growth in any of the directions. The total nature of the causality between investments and growth is paralleled by the absolute absence of such a causality between foreign trade and economic growth. The latter presupposes that the causal long-term effect of the dynamic development of the share of foreign trade commodity exchange in terms of the GDP crosses over to growth through the channels of the other independent variables, with which it has causal relations.

The long-term dependency between financial development and economic growth is also very weak. A two–way causality is totally absent. In the direction from finance to growth, it is only the dynamic development of quasi-money in terms of the GDP that stands apart as an incentive for economic growth. In the opposite direction, a long-term dependency is demonstrated

by economic growth with respect to the changes in the share of domestic lending in terms of the GDP, and in the share of non-governmental lending in terms of the GDP, as well as with respect to the changes in the share of domestic financial assets in terms of the GDP. Such a causality also exists in the direction from the per capita GDP growth rate to the changes in the share of the total financial assets in terms of the GDP.

There is, however, a strong and constant causality between financial indicators and the real factors of economic growth – mainly investments and labor, less foreign trade – which indicates that the mutual effect between finance and growth is actually facilitated by and depends on them. All financial indicators manifest themselves as a long-term cause for the dynamic development of the share of gross fixed capital formation in terms of the GDP, and for the rate of change in the number of the employed. The only exception is the case when the share of non-governmental lending in terms of the GDP participates in the production function and the result, which this yields, is that the Granger long-term dependency is lost in the direction to investments. In the direction to foreign trade there is only one long-term causal dependency and it comes from the changes in the share of the total financial assets in terms of the GDP.

A proof evidencing the fact that the factors of the real economy perform in the capacity of transmission mechanisms is the demonstration of a strong reverse long-term causality from these factors themselves towards financial development. The dynamic development of investments is a long-term cause for the changes taking place in the share of domestic lending in terms of the GDP, of the share of non-governmental lending in terms of the GDP, and also for the changes in the share of domestic financial assets in terms of the GDP. On the other hand, the dynamic development of labor and foreign trade bring about long-term changes in the share of the M2 monetary aggregate in terms of the GDP, the share of liquid liabilities in terms of the GDP, as well as in the share of non-governmental lending in terms of the GDP, when economic growth is represented by the growth rate of the real GDP. When economic growth is explicated through the growth rate of the per capita real GDP, then the aforesaid two factors also cause long-term changes in the share of domestic lending in terms of the GDP. For their part, the changes in the share of foreign trade commodity exchange in terms of the GDP act as a long-term Granger causality for the changes taking place in the share of the total financial assets in terms of the GDP, and only with respect to the per capita GDP growth rate these changes also bring about changes in the share of quasi-money in terms of the GDP.

The next stage of the analysis deals with the task of outlining the quantitative contribution of the individual financial variables to economic growth, which serves as a basis for the subsequent treatment aimed at determining the role of each of the independent variables from the real economy acting in the capacity of a transmission mechanism from finance to growth and vice versa. During the 1997–2006 period, the "authentic" production function has only one statistically significant independent variable – investments – all the coefficients of which are entirely positive (see the equations and their coefficients in column (2) in Addenda from 15 to 20). This means that the growth in the share of the gross fixed capital formation in terms of the GDP has a positive contribution to economic growth as follows: an increase in the growth rate of gross fixed capital formation in terms of the GDP by 1 per cent brings about an increase in the real GDP growth rate by nearly 0.8 per cent, and a respective increase in the per capita real GDP growth rate by 0.7 per cent.

Labor is a statistically insignificant factor with a positive but relatively weak contribution to economic growth. Foreign trade is also statistically insignificant, but what it manifests is a symbolical positive effect on the real GDP growth rate, and a very weak negative impact on the per capita GDP growth rate.

In all dependencies analyzed during the second (post–currency–board) period, the contribution of the financial variables is negative, in the way observed during the first (pre-currency board) period, the only exception being the share of non-governmental lending in terms of the GDP (see the last row of each section of column (1) in the commented tables). The results from the comparison of the coefficients shown in column (1 – 2) indicate that the inclusion of any of the seven financial variables in all possible cases brings about a sizeable decrease of the impact exerted by investments – as much as up to two and half times in the various combinations.

When we take into account the dynamic development of the share of quasi-money in terms of the GDP, we observe the highest level of reduction, where the contribution of investments drops from 0.76 per cent to 0.24 per cent, or by 0.52 percentage points (with respect to the real GDP growth rate), and from 0.70 per cent to 0.14 per cent, or by 0.56 percentage points (with respect to the per capita real GDP growth rate). A smaller reduction is observed in connection with the participation of the share of the various forms of lending in terms of the GDP, and also with the participation of the various financial assets in terms of the GDP, where the registered decline of the impact is by 0.16 percentage points to 0.30 percentage points. If we turn around the above logic of reasoning, we can also claim that the exclusion of any of the financial variables brings about an increased contribution of investments to economic growth within the quantitative limits considered earlier in this paragraph.

Having analyzed the changes in the contribution of the real factors for economic growth, brought about by the inclusion of the various financial variables, we can now move on to considering their own contribution by successively adding them to the production function of investments, labor, and foreign trade (see the interpretation of the differences between the coefficients displayed in column (1 – 3) in the tables of Addenda 15 to 20).

The inclusion of the dynamic development of the share of the gross fixed capital formation in terms of the GDP actually leads to the elimination of the positive and relatively high contribution of the labor factor, and in essence this inclusion turns it into statistically insignificant (see Addenda 15 and 18). Such a change has not been observed only with respect to production functions with the participation of the relative shares of non-government lending and the total financial assets in terms of the GDP, where the labor factor remains insignificant, regardless of the addition or elimination of the variable, which stands for the share of the gross fixed capital formation in terms of the GDP. The outlined general trend of neutralizing the role of employment when investments participate in the equation can be interpreted as a sign for the presence of a closer connection between them, and also as a reason for accepting them as mutually complementary elements. To a large extent this corresponds with the conclusion drawn in chapter one of this section of the study, concerning the predominantly extensive nature of economic growth with respect to both its major factors of production, namely labor and capital.

Much like the situation with the labor factor, the inclusion of investments in the production function with the participation of the share of liquid liabilities in terms of the GDP has as its result the "degradation" of foreign trade, i.e. it turns into a statistically insignificant factor for economic growth. The same effect is observed with the participation of the share of non-governmental lending in terms of the GDP, but only with respect to the real GDP growth rate. On the contrary, as far as the per capita GDP growth rate is concerned, with the participation of the share of domestic lending in terms of the GDP and the share of non-governmental lending in terms of the GDP, foreign trade remains statistically significant. The explanation once again can be found in the existence of certain internal connections between the independent variables, including some connectedness by means of the external funding of investments (in terms of the two lending indicators employed in this study), and in this particular case for instance such connectedness is effected through the channels of foreign trade. The inclusion of investments in the equations containing the rest of the financial indicators does not give rise to any changes in the initial statistical insignificance of the openness of the economy, which is embodied by the share of the foreign trade commodity exchange and turnover in terms of the GDP.

The addition of investments deteriorates – to a large extent at that – the effect of the financial variables in five of the cases, whereas in four of them – the presence of the share of quasi-money in terms of the GDP, the share of the M2 monetary aggregate in terms of the GDP, the share of liquid liabilities in terms of the GDP, and the share of total financial assets in terms of the GDP – reverses the direction of their impact on growth, completely overturning it from positive into negative, whereby the quantitative reduction is relatively high – within the interval between 0.21 per cent and 0.65 per cent. In the fifth case, with the participation of the share of non-governmental lending in terms of the GDP, the negative impact is expressed in the decline of the positive effect by 0.10 per cent (from 0.14 per cent to 0.04 per cent with respect to the real GDP growth rate and from 0.16 per cent to 0.06 per cent with respect to the per capita real GDP growth rate). As far as the production function with an added financial indicator for the share of liquid liabilities in terms of the GDP is concerned, the impact of investments also reveals a positive projection, inasmuch as it turns the statistically insignificant financial variable into a statistically significant one, although the sign preceding it is negative. The same effect of acquiring statistical significance is observed with respect to the share of total financial assets in terms of the GDP, but here it only concerns the per capita GDP growth rate, inasmuch as with respect to the other economic growth indicator it is statistically significant in both of the cases, which this study explores.

When the other two indicators participate – the share of domestic lending in terms of the GDP and the share of domestic financial assets in terms of the GDP – the inclusion of investments is positive. In the first case the positive coefficient, and in the second case the negative coefficient before the financial variable decrease their absolute value. An accompanying positive effect is also the fact that the share of domestic lending in terms of the GDP turns from a statistically insignificant into a statistically significant variable.

The complex impact of the simultaneous inclusion of investments and exclusion of the financial variable (see column (2 – 3) in the tables displayed in the Addenda) on the whole confirms the conclusions made above about the effect of investments. What is characteristic for this combinations is that with respect to them all remaining factors are statistically insignificant, at least for one group of combinations, whereby the differences in the coefficients reproduce their own coefficients preceding investments and financial variables because of their simultaneously being included and excluded.

Upon the inclusion of the labor factor (even though it is statistically insignificant) in the production function, it is the factor of investments that is mainly repressed. What is observed in this situation is a mirror effect, which

means that the two factors act on the principle of communicating or interconnected vessels. The inclusion of the changes in the share of the gross fixed capital formation in terms of the GDP in the production function totally (in all cases) and to a significant extent represses the effect and contribution of labor on economic growth (this has already been proved in the earlier stages of the study). On the contrary, the inclusion of the employment growth rate factor reduces the impact of investments on economic growth with respect to all financial variables to a considerably high extent – within the interval from 0.10 per cent to 0.63 per cent.

Furthermore, taking into account the behavior of the independent variables in the dependencies subject to the study, we observe a definite regularity in the grouping of the four independent variables in pairs. The "investments – foreign trade" pair in principle has a completely opposite behavior to the behavior of the "labor – financial variable" pair. This gives additional grounds to substantiate the claim that the major transmission mechanisms from finance to economic growth pass through investments and foreign trade, the former enjoying a much higher transmission capacity than the latter in the post-currency board period after 1997.

In quantitative terms, the addition of labor to the production function diminishes the impact of investments to the greatest extent in the presence of the indicators for the share of total financial assets in terms of the GDP and the share of liquid liabilities in terms of the GDP, whereby the reduction for the former indicator is by -0.52 per cent concerning the real GDP growth rate, and by -0.59 per cent concerning the per capita GDP growth rate, and for the latter indicator this reduction is by -0.46 per cent in terms of the real GDP growth rate, and by -0.63 per cent in terms of the per capita GDP growth rate respectively.[22] The weakest reductions, which on their own are relatively large on the background of the changes in all the rest of the indicators, have been registered upon the participation of the share of quasi-money in terms of the GDP, where they are expressed by decreasing the contribution of investments to the real GDP growth rate by 0.10 per cent, and by a 0.24 per cent reduction of the contribution of investments to the per capita real GDP growth rate respectively.

The inclusion of labor, on the whole, has a negative impact on the role of foreign trade for the promotion of economic growth, but this negative impact is much smaller in comparison with the negative role played by labor with respect to investments, and expressed in quantitative terms it has been measured to range within the interval from 0.02 per cent to 0.16 per cent. With five of the financial variables, the changes in the share of the foreign trade commodity exchange in terms of the GDP remain statistically insignificant

determinants of economic growth, irrespective of the inclusion or elimination of the labor factor of production. When the dependent variable is the real GDP growth rate, the participation of the remaining two variables – the share of quasi-money in terms of the GDP and the share of non-governmental lending in terms of the GDP – turns foreign trade from a statistically significant factor with a positive effect on economic growth into a statistically insignificant factor with a weakened positive impact. When the dependent variable is the per capita GDP growth rate and the share of domestic lending in terms of the GDP participates in the equation, foreign trade turns from an insignificant factor into a significant one with in increasingly negative impact. And again, when the share of non-governmental lending in terms of the GDP participates in the equation, foreign trade remains a statistically significant factor, but its positive impact is strongly reduced.

If we take into account the number of the employed or the employment rate, in four out of all the seven cases it has a positive effect on the contribution of financial indicators to economic growth, in the sense that to various degrees it reduces the negative impact, which the employment rate has at large, although this negative effect remains negative nonetheless. In two of the equations (their indicators being the share of the M2 monetary aggregate in terms of the GDP and the share of total financial assets in terms of the GDP) we observe a stronger limitation of the negative impact on economic growth to the order of 0.16 – 0.20 per cent, whereby the statistical significance of the indicators has been preserved. In the other two cases – with the participation of quasi-money in terms of the GDP and the share of the liquid liabilities in terms of the GDP – what we observe is the transformation of the statistical insignificance of these indicators into statistical significance, with a relatively weaker reduction of their impact, whereby their values range within the interval from 0.01 per cent to 0.08 per cent. As for the remaining three indicators, the changes are also negative. For two of them – the share of domestic lending in terms of the GDP and the share of domestic financial assets in terms of the GDP – once again we observe a transformation of their statistical insignificance into statistical significance, but their impact now turns from positive into negative. It is only with the share of non-governmental lending in terms of the GDP that both the statistical significance and positive effect are preserved, but here we also observe a reduction to the tune of 0.16 per cent (from 0.19 per cent to 0.03 per cent with respect to the real GDP growth rate, and from 0.22 per cent to 0.06 per cent with respect to the per capita real GDP growth rate). On the whole, the inclusion of the labor factor of production has a contradictory effect on the contribution of the different financial variables to economic growth, and its overall resultant value inclines to zero.

The joint accounting for the results from the parallel inclusion of the labor factor of production and the exclusion of the financial variable (see column (2 – 3)) confirms in a categorical way the conclusions made about the impact of the employment rate on the contribution of the rest of the independent variables to economic growth. The impact of investments and foreign trade on economic growth is definitely strongly negative. According to the former indicator, the effect is negative in five out of the seven possible cases. A positive impact is observed only upon the exclusion of the share of quasi-money in terms of the GDP, which concerns economic growth in both its dimensions, and upon the elimination of the share of the M2 monetary aggregate in terms of the GDP, which concerns the GDP growth rate alone, whereby in all these cases the coefficients are statistically significant.

The share of the foreign trade commodity exchange in terms of the GDP is statistically insignificant in all cases and in five out of the seven variants, where its contribution diminishes with respect to both the real GDP and the per capita real GDP. The only exceptions are observed with the share of domestic lending in terms of the GDP and the share of domestic financial assets in terms of the GDP, which in quantitative terms are symbolical and have been measured to stand within the 0.01 per cent – 0.03 per cent range.

The inclusion of the foreign trade factor of production has an effect on economic growth similar to the inclusion of investments, but this effect is of a lower intensity (see Addenda 17 and 20). The impact of the changes in the share of the gross fixed capital formation in terms of the GDP is positive, both in terms of its overall quantitative level and in terms of the number of indicators. If the dependent variable is the real GDP growth rate, in five of the cases we observe that investments have a growing impact on the GDP growth rate, which reaches almost 0.1 per cent at very good levels of statistical significance, when the share of non-governmental lending in terms of the GDP participates in the equation. The participation of the share of quasi-money in terms of the GDP turns investments from a statistically insignificant into a statistically significant factor, but the impact of investments slightly declines. A slight decline of the impact made by the share of gross fixed capital formation can also be observed, when the share of domestic lending in terms of the GDP participates in the equation at a good level of statistical significance of its coefficients. If the dependent variable is the per capita GDP growth rate, the picture is totally reversed: in five out of all the cases we observe a diminishing impact, and in two of the cases – an increasing impact. On the whole, however, when foreign trade is included with a strong statistical significance and respective prevalence, what we observe is that the positive impact of investments on the economic growth rate remains in force.

In principle, the labor factor of production is totally insignificant in the complete production function and remains insignificant when the openness of the economy is included in and excluded from the equation. There is a certain particularity, however, when foreign trade is added and its essence is that it turns all the seven financial variables from statistically insignificant into statistically significant. With respect to the real GDP growth rate, in six of all the cases we observe a reduction of the negative impact played by the financial variables, whereas in the case, in which the share of total financial assets in terms of the GDP participates, the positive impact turns into a negative one. It is only with the share of non-governmental lending in terms of the GDP that the positive impact is slightly enhanced.

As far as the second indicator – the per capita real GDP growth rate – is concerned, the reduction of the impact exerted by the financial variables is the same in six of the cases. In two of them, where the share of quasi-money in terms of the GDP and the share of domestic financial assets in terms of the GDP participate, we observe an enhancement of the negative impact, whereas in the remaining four cases, with the participation of the indicators for the share of the M2 monetary aggregate in terms of the GDP, the share of liquid liabilities in terms of the GDP, the share of domestic lending in terms of the GDP, and the share of total financial assets in terms of the GDP, what we observe is a transition from a positive to a negative effect. Once again, only with the participation of the share of non-governmental lending in terms of the GDP, what is registered is a slight increase of the positive impact on economic growth.

The simultaneous taking into account the inclusion of foreign trade and the exclusion of the financial variable (see column (2 – 3) of the tables in the Addenda attached herein) undoubtedly reinforces and confirms the conclusions made concerning the impact of the dynamic development of the share of the foreign trade commodity exchange and turnover in terms of the GDP on the factor effect on economic growth. The effect on the contribution of investments to economic growth in this case is absolutely positive in all the seven possible cases, for each one of the growth indicators, at very good levels of statistical significance at that (statistical insignificance has been registered only with respect to the participation of the share of quasi-money in terms of the GDP). On the contrary, the impact on the contribution of labor in all cases is statistically insignificant and predominantly negative. A statistical insignificance has also been observed with the addition of the financial indicators, when foreign trade is excluded from the equation, whereby their opposite impacts get mutually neutralized in quantitative terms.

The conclusion is that the behavior of the real factors of economic growth and the financial variables in their successive and simultaneous inclusion and exclusion from the constructed production functions gives us sufficient reasons to assess them as linking devices and transmission mechanisms between the real economy and the financial system. Investments manifest themselves as the strongest channel of impulses from financial development to economic growth.

Unlike the previous period subject to study, foreign trade has lost its role of a major mechanism serving as a transmission between the banking sector and the real economy. Such an intermediating function has been observed with respect to the changes in the employment rate, which turn out to be strongly connected with the dynamic development of investments, but in terms of their impact they are statistically insignificant. At the same time, the good level of statistical significance of all financial variables in the complete production function also testifies to the presence of a channel transmitting effects through the factor productivity. This is a new result, too, totally opposite to the situation observed up to 1997, and its essence is that the dynamic development of the share of non-governmental lending in terms of the GDP has a stimulating impact on growth through this mechanism precisely.

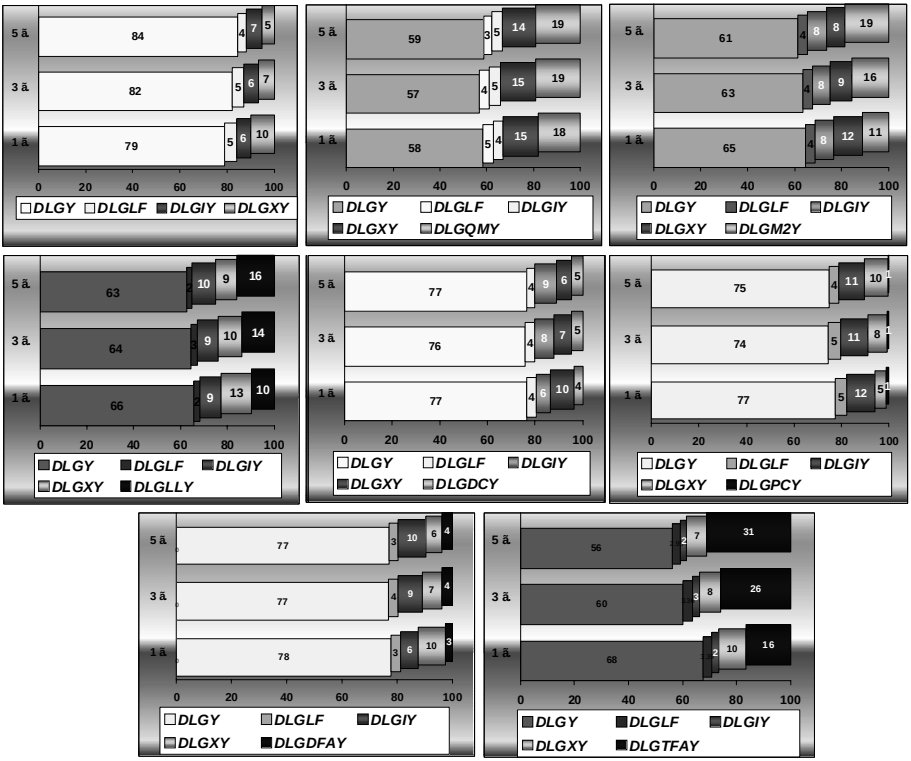
The results outlined above can be taken to be adequate to the dynamic development of the economy, its structure, and its openness in the period after the implementation of the currency board mechanism. We could claim (in the orthodox Keynesian sense) that these two factors of growth, namely – investments and foreign trade, to different degrees act as transmission mechanisms of the impact, which the changes in the financial system have on economic growth.

Now that we have assessed the role of the different variables on the basis both of the changes observed in the coefficient preceding them in the equations of the production functions, and in accordance with the changes taking place in their statistical significance, what is important to undertake is to carry out a prognostic econometric analysis. The goal is to follow up the changes in the contribution of each individual variable in the course of time, as well as the responses of the variables upon the absorption of various shocks.

Upon the application of the function for variance decomposition, a confirmation was obtained once again of the major conclusion obtained by all models used thus far, about the dominating role of the degree of significance of the dependent variable, which usually prevails over all the rest of the variables taken together, i.e. in all the cases subject to this study the contribution of the GDP growth rate or the per capita GDP growth rate amounts to more than 50 per cent (see Figure 1).

**Figure 1**

**A FORECAST OUTLINING THE CONTRIBUTION OF THE GDP GROWTH RATE, INVESTMENTS, LABOR, FOREIGN TRADE AND EACH INDIVIDUAL FINANCIAL VARIABLE**




The next regularity observed in the study is that the contribution of the dependent variable is marked by a contradictory dynamic development, with a tendency for a slight decrease in the course of time. The dynamic development of the labor and foreign trade factors reveal the same tendency – their contribution in a future period has a tendency for decline. With the changes in the employment rate this decline is more than truly symbolic, whereby in the general case in five years' time it does not exceed one percentage point. It is only with the "authentic" production function (without the participation of any financial variable) that this decline goes as high as 1.5 percentage points.

With respect to foreign trade, the decline is within the order of 3 to 5 percentage points after a five years' period of time, the only exception from the indicated percentage point interval being the case with an included share of quasi-money in terms of the GDP, when the decline is less than a percentage point. An increase has been observed only in the case with the participation of the share of non-governmental lending in terms of the GDP, where the contribution of the dynamic development of the share of foreign trade commodity exchange marks a rise by 4.76 percentage points.

On the whole, investments and financial variables demonstrate an increase of the extent of their significance with time. As far as the share of the gross fixed capital formation in terms of the GDP is concerned, it marks the biggest increases by 3.74 percentage points with the participation of the share of domestic financial assets in terms of the GDP, and by 3.06 percentage points upon the inclusion of the share of domestic lending in terms of the GDP, whereas the rest of the increases are within the limits of 1 percentage point. In two of the cases, there is also a slight decline of the degree of their significance: with respect to the share of total financial assets in terms of the GDP it is by 0.12 percentage points, and with respect to the share of non-governmental lending in terms of the GDP – by 1.23 percentage points. With respect to the financial variables, the increases of their significance with time are relatively high.

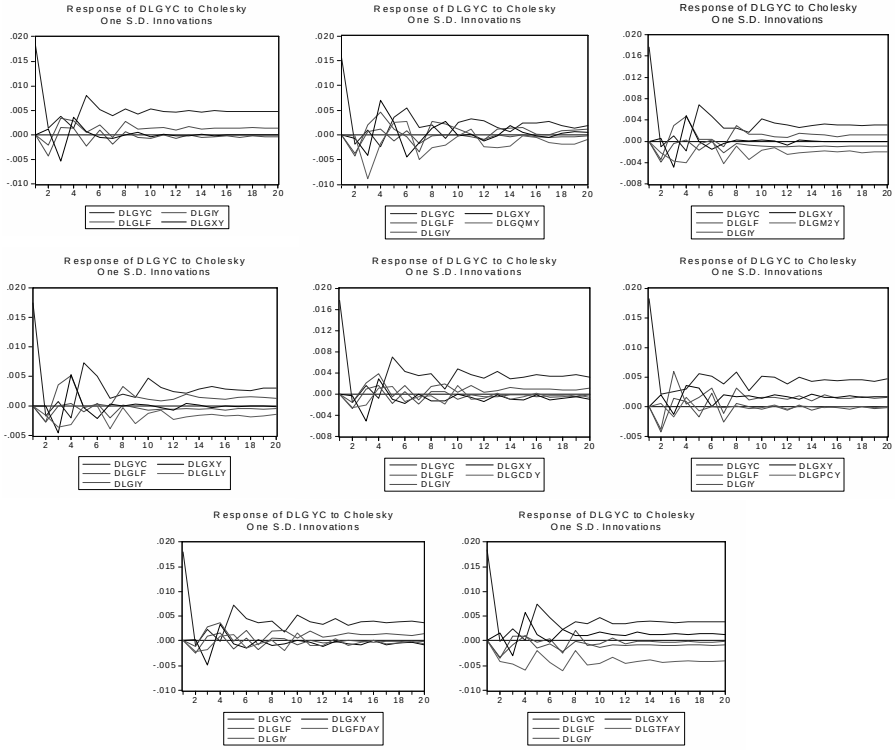
The dynamic development of the share of total financial assets in terms of the GDP increases its contribution by 14.74 percentage points up to the fifth year, that of the share of the M2 monetary aggregate in terms of the GDP – by 7.42 percentage points, and that of the share of liquid liabilities in terms of the GDP – by 6.53 percentage points. For the rest of the financial variables, the increase is to the order of about 1 per cent, and only the changes in the share of non-governmental lending in terms of the GDP diminishes its contribution by 0.44 percentage points.

Because of the relatively great closeness and the overlapping of the econometric results with respect to the two economic growth indicators employed in this study, a fact which has already been subject to comments earlier in the text, Figure 2 displays the graphic expression of the responses of the variables with respect to the per capita real GDP growth rate, but the conclusions are entirely valid for the other growth indicator as well, namely the real GDP growth rate. Whereas in the spreadsheet tables in the Addenda the shock absorption has been followed up until the end of the third year, the graph shows its follow–up till the end of the fifth year, which has been done to the purpose of the better visualization of their fading away or abatement with the different variables. In the general case, though with different heights of the fluctuation amplitudes, the abatement happens about the end of the

fourth year, but with certain variables (which is especially visible with the dynamic development of the share of quasi-money in terms of the GDP) shock absorption continues even after the fifth year.

**Figure 2**

**IMPULSE RESPONSES BETWEEN THE PER CAPITAL GDP GROWTH RATE, INVESTMENTS, LABOR, FOREIGN TRADE, AND EACH OF THE FINANCIAL VARIABLES**




With the successive exclusion of the different variables from the production function, we arrive at interesting shifts of the role in future periods of time, and this is a fact, which also merits an assessment of their role as transmission mechanisms. If investments are excluded, the degree of significance of the dependent variable – the economic growth rate – decreases very strongly with time, by about 12 percentage points on the average for a five years' period of time. This is offset by the sharp increase of the contribution of labor (by about 8 percentage points on the average) and the retained positive impact of the financial variables of about 4 percentage points on the average.

The role of foreign trade in this case is strongly reduced and it marks a slight decrease of about 1 percentage point.

When the rate of change in the number of the employed is excluded, we observe an entirely positive contribution of economic growth of about 7 percentage points on the average for a future period of around five years. This totally positive contribution (including all financial variables) is compensated by the negative contribution of the rate of change of the share of gross fixed capital formation in terms of the GDP by about 2.5 percentage points, and also by the negative contribution of the rate of change of the share of foreign trade commodity exchange in terms of the GDP by about 4.5 percentage points on the average, whereby the contribution of the different variables takes different directions, it is generally weak, and gravitates to zero. This result once again confirms the fact, which we have already proven, that investments and foreign trade act in the capacity of transmission mechanisms between financial development and economic growth.

When we exclude the last of the factors of production – foreign trade – it is economic growth again that responds most strongly with time, whereby its own contribution after the fifth year is around 1.5 percentage points on the average, which is offset by the increasing contribution of investments by about 1 percentage point and the increasing contribution of the financial variables by about 0.5 percentage points, as well as by the simultaneous contribution of the labor factor of production, which is close to zero on the average.

## Conclusion

This econometric study makes a parallel assessment of the role of financial development and the role of the real factors of economic growth. With respect to the factors of economic growth, the study interprets their interconnections and identifies the transmission mechanisms between the two sectors. For the first period subject to the study (1991 – 1996), the changes in employment and investments turn out to be statistically insignificant determinants of economic growth in the "authentic" production function, whereas foreign trade is statistically significant and has a totally negative effect. With the addition of financial variables, the latter either manifest themselves as statistically significant variables with a negative impact on economic growth, or act as statistically insignificant variables. Their inclusion results in the limitation of the negative impact of foreign trade on economic growth and does not change the statistical insignificance of the dynamic development of investments and employment.

The comparison of the production functions with and without investments respectively leads to the conclusion that investments do not affect the contri-

bution of employment, but diminish the negative impact of financial development, and enhance the negative effect of the increasing openness of the economy. The inclusion of labor does not substantially affect the rest of the factors, but upon the elimination of the financial variables, it has favorable effects on the role of foreign trade. The addition of the dynamic development of foreign trade commodity exchange does not eliminate the statistical insignificance of the rest of the real variables and reduces the negative impact of financial development, or turns it into statistically insignificant. It is foreign trade that manifests itself as a major transmission mechanism for transferring effects from finance to economic growth, but there are symptoms that transmission exists through the channels of factor productivity as well.

Over the second period (1997–2006), a two-way long-term causality exists between economic growth, on the one hand, and the dynamic development of investments and employment, on the other. There is no long-term causality between economic growth and foreign trade, and with respect to financial development the causality is one-way and is mainly directed from growth to the financial sector. Financial variables are a long-term cause for the changes in the major factors of production and at the same time it is the factors of production that generate them in the long-term perspective. In the "authentic' production function, only the dynamic development of investments is statistically significant, and it is investments that exert a positive impact. When the financial variables participate in the production function, they manifest themselves as statistically significant, but – with the exception of the changes in the relative share of non-governmental lending – their contribution is negative. Their inclusion in the production function only leads to the reduction of the role played by investments. The addition of the growth of investments unfavorably affects the role of financial development, neutralizes the statistical significance of labor, and with three of the financial variables it has a similar effect on the openness of the economy. The presence of labor represses the contribution of investments, does not affect or affects negatively the role of foreign trade and stimulates the impact of financial development. The addition of the foreign trade commodity exchange leads to an increase of the positive effect of investments, and to the transformation of financial development from a statistically insignificant into statistically significant factor, or to the increase of its quantitative contribution.

The dynamic development of investments has been revealed to be the major transmission mechanism for the materialization of effects from the financial to the real sector of the economy, but once again there are indications for the simultaneous existence of a transmission channel via factor productivity. The forecast for a future period of time is for the predominant con-

tribution of economic growth, though with a slight tendency for decline, as well as for the increasing role of investments and financial variables, whereby the shocks created by the independent variables will be absorbed at a relatively slow rate.

## Endnotes

[1]See *Ranguelova*, R., Contemporary Dimensions of Economic Growth, Dissertation thesis for the acquisition of the Doctor of Economic Sciences degree, *Minasyan*, G., Financial Programming, Sofia, 2001, "Litavra" Publishing House; *Minasyan*, G., Is the Bulgarian Economy Overheating, Economic Thought, 2008, issue 3, pp. 3–29; *Tzalinski*, Tzv., Two Approaches to Measuring the Potential Output in Bulgaria, Discussions Papers, BNB, Sofia, BNB, 2007, No. 57; *Ganev*, K., Measurement of the Overall Factor Productivity: Accounting of Economic Growth in Bulgaria, Discussions Papers, BNB, Sofia, BNB, 2005, No. 48; *Nenovsky*, N. and *Christov*, K., Financial Repression and Credit Rationing in the Conditions of Currency Board in Bulgaria, , Discussions Papers, BNB, Sofia, BNB, 1998, No. 2; *Nenovsky*, N. and *Christov*, K., The New Currency Boards and Discretion: Empirical Evidence from Bulgaria, Economic Systems, 2002, No. 26, p. 55–72; *Christov*, K. and *Mikhailov*, M., Commercial Banks Lending Activity and Loan Portfolio Rationing, Discussions Papers, BNB, Sofia, BNB, 2002, No. 23; Berlemann, M. and Nenovsky, N., Lending of First versus Lending of Last Resort: The Bulgarian Financial Crisis of 1996/1997, Comparative Economic Studies, 2004, No. 46, p. 245–271; *Christov*, K., The Currency Board "The Only Game in Town", Discussions Papers, BNB, Sofia, BNB, 2004, No. 40.

[2]*Nenovsky*, N. and *Christov*, K., Monetary Regimes and the Real Economy (An Empirical Test before and after the Implementation of a Currency Board Mechanism in Bulgaria), Discussions Papers, BNB, Sofia, BNB, 1999, No. 10; *Christov*, K., The Currency Board "The Only Game in Town", Discussions Papers, BNB, Sofia, BNB, 2004, No. 40; *Ganev*, G., Confidence Level in the Foreign Exchange Regime in Bulgaria during 1991 – 2003, an initial attempt at calibration, Discussions Papers, BNB, Sofia, BNB, 2004, No. 38.

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[4]*Valev*, N. and *Tasic*, N., Finance and Growth in Bulgaria – the Effects of Credit Maturity and Credit Size across Economic Sectors, Georgia State University, 2007, mimeo.

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[6]*Koivu*, T., Do Efficient Banking Sectors Accelerate Economic Growth in Transition Countries?, Bank of Finland, Institute for Economies in Transition, BOFIT Discussion Papers, 2002, No. 14; *Mehl*, A. and *Winkler*, A. (2003), Banking and Financial Sector in Transition and Emerging Market Economies, The Ninth Dubrovnik Economic Conference, National Croatian National Bank, June, http://www.hnb.hr/dub–konf/9–konferencija–radovi/mehl–winkler.pdf; *Mehl*, A., *Vespro*, C. and *Winkler*, A. (2006), The Finance–Growth Nexus and Financial Sector Environment: New Evidence from Southeast Europe, ECB–CFS Research Network Working Paper; *Fink*, G., *Haiss*, P. and *Vuksic*, G., Changing Importance of Financial Sectors for Growth from Transition to Cohesion and European Integration, Europainstitut Wirtschaftsuniversität Wien, EI Working Paper, 2004, No. 58, July; *Akimov*, A. and *Wijeweera*, A., Financial Development and Economic Growth. Evidence from Countries in Transition, European Association for Comparative Economics Studies (EACES) 9th Bi–Annual Conference: Development Strategies – A Comparative View.

[7]$R_1$ – real GDP in million denominated BGN in terms of 1995 prices (Y); $R_2$ –per capita real GDP in denominated BGN in terms of 1995 prices – (YC); $R_3$ – share of the gross fixed capital formation in terms of the GDP – (IY); $R_4$ – average number of the employed in the national economy – (LF); $R_5$ – share of the foreign trade commodity exchange in terms of the GDP – (XY);

[8]$F_1$ – share of quasi-money in terms of the GDP – (QMY); $F_2$ – share of the M2 monetary aggregate in terms of the GDP – (M2Y); $F_3$ – share of liquid liabilities in terms of the GDP – (LLY); $F_4$ – share of domestic lending in terms of the GDP – (DCY); $F_5$ – share of the non-governmental sector lending in terms of the GDP – (PCY); $F_6$ – share of domestic bank assets in terms of the GDP– (DFAY); $F_7$ – share of total bank assets in terms of the GDP – (TFAY).

[9]The results from the stationarity test of data, i.e. for the presence of a single root of the dynamic series for each of the variables, have been obtained by means of the parallel application of the extended Dicky–Fuller test (ADF) and the non-parametric Phillips–Peron test (PP), whereby the two tests

have been held both according to the information criterion of Schwartz (SIC) and according to the information criterion of Akaike (AIC). The test of the zero hypothesis, which presupposes non-stationarity or the existence of a single root of the time series subject to the test, is held by comparing the critical value of McKinnon at levels of significance of 1 per cent, 5 per cent and 10 per cent respectively. When the calculated ADF or PP statistics of the respective variable is higher than McKinnon's critical value for the respective value of significance, there are no sufficient grounds for the zero hypothesis to be rejected, and this means that the respective time series is non-stationary.

[10]Let us recall that in the studies we are aware of labor is excluded as a factor altogether, or in the rare cases when it is included, it is present with the indicator "level or number of secondary education diploma holders". Because of the inappropriateness of this indicator in the specific Bulgarian conditions, in order to make the production function complete, this study employs the rate of employment, which reflects the number of the employed in the national economy.

[11]For more detail, see *Engle* R.F. and *Granger* C.W.J., Co–integration and Error Correction: Representation, Estimation and Testing, Econometrica, 1987, No. 55, p. 251–276; S. *Karlin*, T. *Amemiya*, L.A.*Goodman* (eds.), Studies in Econometrics, Time-series and Multivariate Statistics, Academic Press, 1983, New York.

[12]See *Johansen*, S., Statistical Analysis of Cointegration Vectors, Journal of Economic Dynamics and Control, 1988, No. 12 (2–3), p. 231–254; *Johansen*, S. and *Juselius*, K., Maximum Likelihood Estimation and Inferences on Cointegration – with Applications to the Demand for Money, Oxford Bulletin of Economics and Statistics, 1990, No. 52, p. 169–210; Johansen, S., Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models, Econometrica, 1991, No. 59, p. 1551–1580.

[13]About the application of these models upon analyzing the dependency between financial and economic development see *Rousseau*, P. and R. *Sylla*, Emerging Financial Markets and Early U.S. Growth, National Bureau of Economic Research Working Paper, 1999, No.7448; *Rousseau*, P. and *Wachtel*, P., Financial Intermediation and Economic Performance: Historical Evidence from Five Industrialized Countries. Journal of Money, Credit, and Banking 1998, No.30, p. 657–678; *Trabesli*, M., Finance and Growth: Empirical Evidence from Developing Countries, 1960–1990, CAHIER, 2003, No.13, ISSN 0709–9231; Ünalmis, D., The Causality Between Financial Development and Economic Growth: the Case of Turkey, The Central Bank of the Republic of Turkey Research Department Working Paper, 2002, No. 3.

[14]ECT – error correction term.

[15]Such an idea exists in the study of Jordan Shan, who explores only one financial factor – the total amount of credit in the economy. See *Shan*, J., Financial Development and Economic Growth: The Empirical Evidence from China, Proceedings of the 15th Annual Conference of the Association for Chinese Economics Studies Australia, (ACESA), 2003.

[16]See *Toda*, H.Y. and *Yamamoto*, T., Statistical Inference in Vector Autoregressions with Possibly Integrated Processes, Journal of Econometrics, 1995, No. 66, p. 225–250.

[17]For further detail about the application of these functions to the analysis of the relationship between the real and financial sectors see *Rousseau*, P., Historical Perspectives on Financial Development and Economic Growth, Review, 2003/July–August, p. 81–106; *Abu–Bader*, S. and *Abu–Oarn*, A., Financial Development and Economic Growth: Time Series Evidence from Egypt, Discussion Paper, 2005, No.14, Ben–Gurion University of the Negev, Israel; *Shan*, J., Financial Development and Economic Growth: The Empirical Evidence from China, Proceedings of the 15th Annual Conference of the Association for Chinese Economics Studies Australia, (ACESA), 2003; etc.

[18]The results concerning the two indicators employed for the economic growth rate to a large extent proved to be overlapping. This is the reason why when the analysis focuses on the comment of economic growth in the rest of the text, the two indicators are meant simultaneously. In the rare cases when disparities occur, they are analyzed on an individual basis.

[19]According to this structuring, the "liquidity" group includes the first three indicators: share of quasi-money in terms of the GDP, share of the M2 monetary aggregate in terms of the GDP, and share of liquid liabilities in terms of the GDP; the "lending" group includes the following indicators: share of donestic lending in terms of the GDP, and share of non-governmental lending in terms of the GDP; and the last group of "assets" includes: share of domestic financial assets in terms of the GDP, and share of overall financial assets in terms of the GDP.

[20]The econometric results presenting economic growth through the GDP growth rate are arranged in the same succession in Addenda 8, 9 and 10 and then again in Addenda 11, 12 and 13, when economic growth is measured through the indicator of the per capita real GDP growth rate.

[21]The results of Johansen's test for the second (post currency board) period relative to the real GDP growth rate are presented in Addendum 12. The results of the test relative to the per capita real GDP growth rate are absolutely identical from the standpoint of their statistical significance.

[22]In the subsequent text, the coefficients preceding the variables in the equations presented in Addenda 16 and 19 should be followed up and compared accordingly.

**Addendum 1**

## RESULTS FROM THE EXTENDED DICKY–FULLER TEST AND THE PHILLIPS–PERON TEST FOR THE PRESENCE OF A SINGLE ROOT IN THE FIRST DIFFERENCES WITH A LONG–TERM CONSTANT MEDIAN

### 1991–1996

| Variable | ADF and PP statistics, lags, statistical significance as per Akaike's information criterion | | | | | ADF and PP statistics, lags, and statistical significance as per Schwartz's information criterion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ADF | S%L | L* | PP | S%L | ADF | S%L | L* | PP | S%L |
| LGQMY | –6.610229 | 1 | 0 | –6.607924 | 1 | –6.610229 | 1 | 0 | –6.454301 | 1 |
| LGM2Y | –6.884149 | 1 | 0 | –6.883979 | 1 | –6.884149 | 1 | 0 | –6.833722 | 1 |
| LGLLY | –7.376067 | 1 | 0 | –7.374357 | 1 | –7.376067 | 1 | 0 | –7.373756 | 1 |
| LGDCY | –5.700540 | 1 | 0 | –5.698709 | 1 | –5.700540 | 1 | 0 | –5.599162 | 1 |
| LGPCY | –6.306318 | 1 | 0 | –6.303530 | 1 | –6.306318 | 1 | 0 | –6.105781 | 1 |
| LGDFAY | –7.312826 | 1 | 0 | –7.311085 | 1 | –7.312826 | 1 | 0 | –7.312826 | 1 |
| LGTFAY | –7.129386 | 1 | 0 | –7.129338 | 1 | –7.129386 | 1 | 0 | –7.129386 | 1 |
| LGY | –4.758545 | 1 | 0 | –4.758599 | 1 | –4.758545 | 1 | 0 | –4.762987 | 1 |
| LGYC | –4.769790 | 1 | 0 | –4.769841 | 1 | –4.769790 | 1 | 0 | –4.773989 | 1 |
| LGIY | –5.406641 | 1 | 1 | –8.338365 | 1 | –5.406641 | 1 | 1 | –6.006909 | 1 |
| LGLF | –2.811956 | 10 | 2 | –5.709494 | 1 | –2.435844 | | 0 | –2.559051 | |
| LGXY | –4.990551 | 1 | 0 | –4.990544 | 1 | –4.990551 | 1 | 0 | –4.990551 | 1 |

### 1997–2006

| Variable | ADF and PP statistics, lags, statistical significance as per Akaike's information criterion | | | | | ADF and PP statistics, lags, and statistical significance as per Schwartz's information criterion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ADF | S%L | L* | PP | S%L | ADF | S%L | L* | PP | S%L |
| LGQMY | –5.590656 | 1 | 0 | –5.590862 | 1 | –5.590656 | 1 | 0 | –5.607900 | 1 |
| LGM2Y | –4.923623 | 1 | 0 | –18.04363 | 1 | –4.464030 | 1 | 3 | –4.846051 | 1 |
| LGLLY | –5.207708 | 1 | 0 | –14.23452 | 1 | –3.542936 | 1 | 3 | –5.184084 | 1 |
| LGDCY | –5.251563 | 1 | 2 | –3.910668 | 1 | –3.987936 | 1 | 3 | –3.910668 | 1 |
| LGPCY | –5.717747 | 1 | 0 | –5.952908 | 1 | –5.717747 | 1 | 0 | –5.718200 | 1 |
| LGDFAY | –4.175706 | 1 | 2 | –3.130799 | 5 | –3.885720 | 1 | 3 | –3.279975 | 5 |
| LGTFAY | –4.382701 | 1 | 0 | –126.5484 | 1 | –4.382701 | 1 | 0 | –4.307904 | 1 |
| LGY | –14.22611 | 1 | 0 | –13.92711 | 1 | –14.22611 | 1 | 0 | –16.26638 | 1 |
| LGYC | –14.22857 | 1 | 0 | –13.93736 | 1 | –14.22857 | 1 | 0 | –18.10650 | 1 |
| LGIY | –6.014902 | 1 | 1 | –6.736371 | 1 | –6.014902 | 1 | 1 | –11.17446 | 1 |
| LGLF | –4.141746 | 1 | 1 | –4.569605 | 1 | –4.327469 | 1 | 0 | –4.233508 | 1 |
| LGGY | –6.452357 | 1 | 1 | –6.899871 | 1 | –6.452357 | 1 | 1 | –7.044687 | 1 |
| LGXY | –3.653505 | 1 | 2 | –6.254898 | 1 | –7.663980 | 1 | 0 | –7.435486 | 1 |
| LGCPI | –3.582740 | 1 | 2 | –6.351365 | 1 | –6.427045 | 1 | 0 | –6.351365 | 1 |

**Remark:** LGQMY, LGM2Y, LGLLY, LGDCY, LGPCY, LGDFAY, LGTFAY, LGY, LGYC, LFIY, LGLF, LGGY, LGXY, and LGCPI are the designations for the natural logarithms of the share of quasi-money in terms of the GDP, the share of M2 monetary aggregate in terms of the GDP, the share of liquid liabilities in terms of the GDP, the share of domestic credit or lending in terms of the GDP, the share of private lending in terms of the GDP, the share of domestic financial assets in terms of the GDP, the share of total financial assets in terms of the GDP, of the real GDP itself on the basis of 1995 data, , the per capital real GDP, the share of gross fixed capital formation in terms of the GDP, the employment rate (the number of the employed), the share of government purchases in terms of the GDP, the share of the foreign trade commodity exchange and turnover (exports plus imports) in terms of the GDP, and the index of consumer prices (1995 = 100 per cent). L* is the optimum length of lag, which according to Aikake's criterion is of a 5 lags maximum value, and according to Schwartz's criterion is of a 9 lags maximum value. S per centL displays the statistical significance at levels 1 per cent, 5 per cent, and 10 per cent, or the absence of a statistical significance altogether.

**Addendum 2**

**INDICATORS (INDEPENDENT VARIABLES) CONCERNING THE REAL ECONOMY:**

1. DLGY is the rate of change of the real GDP;

2. DLGYC is the rate of change of the per capita real GDP;

3. DLGIY – is the rate of change of the share of gross fixed capital formation in terms of the GDP;

4. DLGLF – is the rate of change of the number of the employed (employment rate);

5. DLGGY – is the rate of change of the share of government purchases in terms of the GDP;

6. DLGXY – is the rate of change of the share of foreign trade commodity exchange in terms of the GDP;

7. DLGCPI – is the rate of change of the consumer price index;

**INDICATORS (INDEPENDENT VARIABLES) CONCERNING THE REAL ECONOMY:**

1. DLGQMY – is the rate of change of the share of quasi-money in terms of the GDP;

2. DLGM2Y – is the rate of change of the share of the M2 monetary aggregate in terms of the GDP;

3. DLGLLY – is the rate of change of the share of liquid liabilities of the banking system in terms of the GDP;

4. DLGDCY – is the rate of change of the share of domestic lending in terms of the GDP;

5. DLGPCY – is the rate of change of the share of lending for the non-governmental sector (private lending) in terms of the GDP;

6. DLGDFAY – is the rate of change of the share of domestic financial assets of the banking system in terms of the GDP;

7. DLGTFAY – is the rate of change of the share of total financial assets in the banking system in terms of the GDP.

## Addendum 3

### PAIR–WISE GRANGER CAUSALITY TEST FOR THE 1991–1996 PERIOD OF TIME BETWEEN THE GDP, THE PER CAPITA GDP, INVESTMENTS, AS WELL AS EMPLOYMENT AND FOREIGN TRADE RESPECTIVELY

| | Dependent variable | | | |
|---|---|---|---|---|
| Indicator | DLGY | DLGIY | DLGLF | DLGXY |
| DLGY | | | | |
| DLGIY | | | | |
| DLGLF | | | | |
| DLGXY | | | | |

| | Dependent variable | | | |
|---|---|---|---|---|
| Indicator | DLGYC | DLGIY | DLGLF | DLGXY |
| DLGYC | | | | |
| DLGIY | | | | |
| DLGLF | | | | |
| DLGXY | | | | |

**Remark:** DLGY, DLGYC, DLGIY, DLGLF, DLGXY, DLGQMY, DLGM2Y, DLGLLY, DLGDCY, DLGPCY, DLGDFAY, DLGTFAY stand respectively for the first differences of the natural logarithms of the real GDP and the per capita real GDP in million denominated BGN at 1995 prices, for the share of gross fixed capital formation in terms of the GDP, for the number of the employed in the national economy, for the share of foreign trade in terms of the GDP, for the share of quasi-money in terms of the GDP, for the share of the M2 monetary aggregate in terms of the GDP, for the share of liquid liabilities in terms of the GDP, for the share of domestic lending in terms of the GDP, for the share of private or non-governmental lending in terms of the GDP, for the share of domestic financial assets in terms of the GDP, and for the share of the total financial assets in terms of the GDP.

The above designations are valid for all tables concerning the pair–wise Granger test.

The upper number indicates the value of the F–statistics, and the lower number indicates the statistical probability (significance).

*, **, *** indicate the statistical significance at levels of 10 per cent, 5 per cent, and 1 per cent respectively.

## Addendum 4

### PAIR–WISE GRANGER CAUSALITY TEST FOR THE 1997–2006 PERIOD OF TIME BETWEEN THE GDP, THE PER CAPITA GDP, INVESTMENTS, AS WELL AS EMPLOYMENT AND FOREIGN TRADE RESPECTIVELY

| | Dependent variable | | | |
|---|---|---|---|---|
| Indicator | DLGY | DLGIY | DLGLF | DLGXY |
| DLGY | | 7.98424<br>0.00795*** | | |
| DLGIY | 12.80350<br>0.00109*** | | | |
| DLGLF | 2.87867<br>0.09917* | | | |
| DLGXY | 2.70891<br>0.10928* | | | |

| | Dependent variable | | | |
|---|---|---|---|---|
| Indicator | DLGYC | DLGIY | DLGLF | DLGXY |
| DLGYC | | 8.13219<br>0.00475*** | | |
| DLGIY | 12.54450<br>0.00121*** | | | |
| DLGLF | | | | |
| DLGXY | | | | |

**Remark:** DLGY, DLGYC, DLGIY, DLGLF, DLGXY, DLGQMY, DLGM2Y, DLGLLY, DLGDCY, DLGPCY, DLGDFAY, DLGTFAY stand respectively for the first differences of the natural logarithms of the real GDP and the per capita real GDP in million denominated BGN at 1995 prices, for the share of gross fixed capital formation in terms of the GDP, for the number of the employed in the national economy, for the share of foreign trade in terms of the GDP, for the share of quasi-money in terms of the GDP, for the share of the M2 monetary aggregate in terms of the GDP, for the share of liquid liabilities in terms of the GDP, for the share of domestic lending in terms of the GDP, for the share of private or non-governmental lending in terms of the GDP, for the share of domestic financial assets in terms of the GDP, and for the share of the total financial assets in terms of the GDP.

The above designations are valid for all tables concerning the pair–wise Granger test.

The upper number indicates the value of the F–statistics, and the lower number indicates the statistical probability (significance).

*, **, *** indicate the statistical significance at levels of 10 per cent, 5 per cent, and 1 per cent respectively.

Addendum 5

## PAIR–WISE GRANGER CAUSALITY TEST FOR THE 1991–1996 PERIOD OF TIME BETWEEN THE GDP, THE PER CAPITA GDP, INVESTMENTS, EMPLOYMENT, AS WELL AS AND FOREIGN TRADE AND FINANCIAL DEVELOPMENT RESPECTIVELY

Dependent variable

| Indicator | DLGY | DLGYC | DLGIY | DLGLF | DLGXY | DLGQMY | DLGM2Y | DLGLLY | DLGDCY | DLGPCY | DLGDFAY | DLGTFAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DLGY | | | | | | 4.65857 | 3.72422 | | 4.27977 | 9.02711 | | |
| DLGYC | | | | | | 0.04390** 4.71416 | 0.06870* 3.76820 | | 0.05245* 4.33305 | 0.00729*** 9.15718 | | |
| DLGIY | | | | | | 0.04279** | 0.06722* | | 0.05114* | 0.00695*** | | |
| DLGLF | | | | | | | | | | | | |
| DLGXY | | | | | | 4.05774 | 2.98525 | | | | | |
| DLGQMY | | | | | | 0.05835* | 0.10025* | | | | | |
| DLGM2Y | 0.07995* 4.37754 | 0.07836* 4.41475 | | 0.09169* | 0.06625* 4.51154 | | | | | | | |
| DLGLLY | 0.05008* | 0.04920** | | 5.69090 | 0.04702** | | | | | | | |
| DLGDCY | | | | 0.02762** 3.26864 | | | | | | | | |
| DLGPCY | | | | 0.08647* 4.01178 | | | | | | | | |
| DLGDFAY | | | | 0.05966* 6.35333 | | | | | | | | |
| DLGTFAY | | | | 0.02082** 6.07801 | | | | | | | | |
| | | | | 0.02338** | | | | | | | | |

**Remark:** The upper number indicates the value of the F–statistics, and the lower number indicates the statistical probability (significance).
*, **, *** indicate the statistical significance at levels of 10 per cent, 5 per cent, and 1 per cent respectively.

Addendum 6

## PAIR-WISE GRANGER CAUSALITY TEST FOR THE 1997–2006 PERIOD OF TIME BETWEEN THE GDP, THE PER CAPITA GDP, INVESTMENTS, EMPLOYMENT, AS WELL AS AND FOREIGN TRADE AND FINANCIAL DEVELOPMENT RESPECTIVELY

Dependent variable

| Indicator | DLGY | DLGYC | DLGIY | DLGLF | DLGXY | DLGQMY | DLGM2Y | DLGLLY | DLGDCY | DLGPCY | DLGDFAY | DLGTFAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DLGY | | | | | | | | 3.07055 | 5.85282 | 19.91150 | 3.35412 | 3.28848 |
| DLGYC | | | | | | | | 0.06121* 3.38438 | 0.00714*** 5.62746 | 0.00000*** 19.49540 | 0.04846** 3.26199 | 0.05113* 3.34541 |
| DLGIY | | | | | | | | 0.04728** | 0.00841*** 5.55686 | 0.00000*** 2.68276 | 0.05226* | 0.04880** |
| DLGLF | | | | | | | | | 0.00885*** 2.73053 | 0.08475* | | |
| DLGXY | | | | | | | 6.67920 | 10.07790 | 0.08138* 10.04500 | 10.02790 | 9.10594 | 3.06149 |
| DLGQMY | | | | | | | 0.00399*** | 0.00045*** | 0.00046*** | 0.00046*** | 0.00081*** | 0.06167* |
| DLGM2Y | | | 0.00267*** 9.37371 | | 4.84206 | | | | | | | |
| DLGLLY | | | 0.00069*** 5.66940 | | 0.01505** 2.81884 | | | | | | | |
| DLGDCY | | | 0.00816*** | 6.70703 | 0.07554* | | | | | | | |
| DLGPCY | | | 3.30258 | 0.00391*** 10.48480 | 2.59134 | | | | | | | |
| DLGDFAY | | | 0.05055** | 0.00035*** 7.23052 | 0.09160* | | | | | | | |
| DLGTFAY | | | 6.00228 | 0.00274*** 3.13018 | 6.34484 | | | | | | | |
| | | | 0.00642*** | 0.05826* | 0.00503*** | | | | | | | |

**Remark:** The upper number indicates the value of the F-statistics, and the lower number indicates the statistical probability (significance).
*, **, *** indicate the statistical significance at levels of 10 per cent, 5 per cent, and 1 per cent respectively.

Addendum 7

## JOHANSEN'S CO–INTEGRATION TEST BETWEEN THE GDP, INVESTMENTS, EMPLOYMENT, FOREIGN TRADE, AND FINANCIAL DEVELOPMENT (1991–1996)

| Independent Variables | $H_0$ $H_1$ | trace statistics | critical value at 5 per cent | proba-bility** | Max–Eigen statistics | critical value at 5 per cent | proba-bility** |
|---|---|---|---|---|---|---|---|
| DLGY, | r = 0* | 83.63434 | 47.85613 | 0.0000 | 35.96427 | 27.58434 | 0.0033 |
| DLGLF, | r <= 1* | 47.67008 | 29.79707 | 0.0002 | 25.86722 | 21.13162 | 0.0100 |
| DLGIY, | r <= 2* | 21.80286 | 15.49471 | 0.0049 | 16.49848 | 14.26460 | 0.0218 |
| DLGXY | r <= 3* | 5.30438 | 3.84147 | 0.0213 | 5.30438 | 3.84147 | 0.0213 |
| DLGY, | r = 0* | 116.27660 | 69.81889 | 0.0000 | 49.07843 | 33.87687 | 0.0004 |
| DLGLF, | r <= 1* | 67.19819 | 47.85613 | 0.0003 | 29.32241 | 27.58434 | 0.0296 |
| DLGIY, | r <= 2* | 37.87577 | 29.79707 | 0.0047 | 26.97931 | 21.13162 | 0.0067 |
| DLGXY | r <= 3 | 10.89646 | 15.49471 | 0.2179 | 6.007799 | 14.2646 | 0.6122 |
| DLGQMY, | r <= 4* | 4.888661 | 3.841466 | 0.0270 | 4.888661 | 3.841466 | 0.0270 |
| DLGY, | r = 0* | 117.0884 | 69.81889 | 0.0000 | 48.21378 | 33.87687 | 0.0005 |
| DLGLF, | r <= 1* | 68.87464 | 47.85613 | 0.0002 | 31.07728 | 27.58434 | 0.0170 |
| DLGIY, | r <= 2* | 37.79736 | 29.79707 | 0.0049 | 27.53818 | 21.13162 | 0.0055 |
| DLGXY | r <= 3 | 10.25918 | 15.49471 | 0.2613 | 5.804944 | 14.2646 | 0.6384 |
| DLGM2Y, | r <= 4* | 4.454234 | 3.841466 | 0.0348 | 4.454234 | 3.841466 | 0.0348 |
| DLGY, | r = 0* | 125.1586 | 69.81889 | 0.0000 | 54.83075 | 33.87687 | 0.0001 |
| DLGLF, | r <= 1* | 70.32781 | 47.85613 | 0.0001 | 32.23261 | 27.58434 | 0.0117 |
| DLGIY, | r <= 2* | 38.09521 | 29.79707 | 0.0044 | 24.68356 | 21.13162 | 0.0151 |
| DLGXY | r <= 3 | 13.41165 | 15.49471 | 0.1006 | 7.067925 | 14.2646 | 0.4811 |
| DLGLLY, | r <= 4* | 6.343723 | 3.841466 | 0.0118 | 6.343723 | 3.841466 | 0.0118 |
| DLGY, | r = 0* | 125.4618 | 69.81889 | 0.0000 | 54.07213 | 33.87687 | 0.0001 |
| DLGLF, | r <= 1* | 71.38968 | 47.85613 | 0.0001 | 31.50362 | 27.58434 | 0.0149 |
| DLGIY, | r <= 2* | 39.88606 | 29.79707 | 0.0025 | 23.26781 | 21.13162 | 0.0246 |
| DLGXY | r <= 3* | 16.61825 | 15.49471 | 0.0337 | 10.33836 | 14.2646 | 0.1907 |
| DLGDCY | r <= 4* | 6.279891 | 3.841466 | 0.0122 | 6.279891 | 3.841466 | 0.0122 |
| DLGY, | r = 0* | 114.1679 | 69.81889 | 0.0000 | 43.10933 | 33.87687 | 0.0030 |
| DLGLF, | r <= 1* | 71.0586 | 47.85613 | 0.0001 | 29.5539 | 27.58434 | 0.0276 |
| DLGIY, | r <= 2* | 41.5047 | 29.79707 | 0.0015 | 27.0401 | 21.13162 | 0.0065 |
| DLGXY | r <= 3 | 14.4646 | 15.49471 | 0.0710 | 8.765609 | 14.2646 | 0.3062 |
| DLGPCY | r <= 4* | 5.698991 | 3.841466 | 0.0170 | 5.698991 | 3.841466 | 0.0170 |
| DLGY, | r = 0* | 125.7942 | 69.81889 | 0.0000 | 54.72319 | 33.87687 | 0.0001 |
| DLGLF, | r <= 1* | 71.07103 | 47.85613 | 0.0001 | 30.7892 | 27.58434 | 0.0187 |
| DLGIY, | r <= 2* | 40.28183 | 29.79707 | 0.0022 | 26.01108 | 21.13162 | 0.0095 |
| DLGXY | r <= 3 | 14.27075 | 15.49471 | 0.0758 | 7.890295 | 14.2646 | 0.3899 |
| DLGDFAY | r <= 4* | 6.380455 | 3.841466 | 0.0115 | 6.380455 | 3.841466 | 0.0115 |
| DLGY, | r = 0* | 120.442 | 69.81889 | 0.0000 | 50.76831 | 33.87687 | 0.0002 |
| DLGLF, | r <= 1* | 69.67373 | 47.85613 | 0.0001 | 32.04861 | 27.58434 | 0.0124 |
| DLGIY, | r <= 2* | 37.62512 | 29.79707 | 0.0051 | 25.46791 | 21.13162 | 0.0115 |
| DLGXY | r <= 3 | 12.15721 | 15.49471 | 0.1495 | 7.250217 | 14.2646 | 0.4600 |
| DLGTFAY | r <= 4* | 4.906992 | 3.841466 | 0.0267 | 4.906992 | 3.841466 | 0.0267 |

$H_0$ – zero hypothesis for the absence of a long-term causality

$H_1$ – single hypothesis for the presence of a long-term causality

* marks the rejection of the hypothesis for the absence of long-term causality at a probability level of 0.05

** – p–values of McKinnon, Hoge, and Mischellis (1999)

**Remark:** The criss–crossed combinations of variables indicate co-integration dependencies at a 5 per cent and a 10 per cent level of statistical significance.

Addendum 8

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE GDP GROWTH RATE (1991 – 1996) AND RESPECTIVELY THE DEPENDENT DLGY VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGLF AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO–INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.030997 | -0.027519 | -0.032276 | -0.003478 | 0.001279 | 0.004757 |
| DLGLF | -0.180124 | -0.161655 | -0.184660 | -0.018469 | 0.004536 | 0.023005 |
| DLGIY | 0.052173 | 0.068786 | | -0.016613 | 0.052173 | 0.068786 |
| DLGXY | -0.534859 | -0.595160 | -0.497547 | 0.060301 | -0.037312 | -0.097613 |
| DLGQMY | -0.200054 | | -0.208509 | -0.200054 | 0.008455 | 0.208509 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.033853 | -0.027519 | -0.035225 | -0.006334 | 0.001372 | 0.007706 |
| DLGLF | -0.168740 | -0.161655 | -0.172894 | -0.007085 | 0.004154 | 0.011239 |
| DLGIY | 0.054572 | 0.068786 | | -0.014214 | 0.054572 | 0.068786 |
| DLGXY | -0.526337 | -0.595160 | -0.487747 | 0.068823 | -0.038590 | -0.107413 |
| DLGM2Y | -0.244989 | | -0.251969 | -0.244989 | 0.006980 | 0.251969 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.040619 | -0.027519 | -0.042058 | -0.013100 | 0.001439 | 0.014539 |
| DLGLF | -0.118585 | -0.161655 | -0.122697 | 0.043070 | 0.004112 | -0.038958 |
| DLGIY | 0.060940 | 0.068786 | | -0.007846 | 0.060940 | 0.068786 |
| DLGXY | -0.360568 | -0.595160 | -0.317601 | 0.234592 | -0.042967 | -0.277559 |
| DLGLLY | -0.469323 | | -0.472921 | -0.469323 | 0.003598 | 0.472921 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039514 | -0.027519 | -0.040517 | -0.011995 | 0.001003 | 0.012998 |
| DLGLF | -0.213713 | -0.161655 | -0.217225 | -0.052058 | 0.003512 | 0.055570 |
| DLGIY | 0.037904 | 0.068786 | | -0.030882 | 0.037904 | 0.068786 |
| DLGXY | -0.436532 | -0.595160 | -0.408836 | 0.158628 | -0.027696 | -0.186324 |
| DLGDCY | -0.430225 | | -0.436673 | -0.430225 | 0.006448 | 0.436673 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.035662 | -0.027519 | -0.037133 | -0.008143 | 0.001471 | 0.009614 |
| DLGLF | -0.062227 | -0.161655 | -0.070566 | 0.099428 | 0.008339 | -0.091089 |
| DLGIY | 0.077256 | 0.068786 | | 0.008470 | 0.077256 | 0.068786 |
| DLGXY | -0.521156 | -0.595160 | -0.471093 | 0.074004 | -0.050063 | -0.124067 |
| DLGPCY | -0.248458 | | -0.241664 | -0.248458 | -0.006794 | 0.241664 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039362 | -0.027519 | -0.040858 | -0.011843 | 0.001496 | 0.013339 |
| DLGLF | -0.156260 | -0.161655 | -0.161148 | 0.005395 | 0.004888 | -0.000507 |
| DLGIY | 0.067120 | 0.068786 | | -0.001666 | 0.067120 | 0.068786 |
| DLGXY | -0.333634 | -0.595160 | -0.287813 | 0.261526 | -0.045821 | -0.307347 |
| DLGDFAY | -0.512599 | | -0.513451 | -0.512599 | 0.000852 | 0.513451 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039878 | -0.027519 | -0.041346 | -0.012359 | 0.001468 | 0.013827 |
| DLGLF | -0.152185 | -0.161655 | -0.156592 | 0.009470 | 0.004407 | -0.005063 |
| DLGIY | 0.061653 | 0.068786 | | -0.007133 | 0.061653 | 0.068786 |
| DLGXY | -0.401066 | -0.595160 | -0.357629 | 0.194094 | -0.043437 | -0.237531 |
| DLGTFAY | -0.408439 | | -0.412205 | -0.408439 | 0.003766 | 0.412205 |

**Addendum 9**

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE GDP GROWTH RATE (1991–1996) AND RESPECTIVELY THE DEPENDENT DLGY VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.030997 | -0.027519 | -0.029633 | -0.003478 | -0.001364 | 0.002114 |
| DLGLF | -0.180124 | -0.161655 | | -0.018469 | -0.180124 | -0.161655 |
| DLGIY | 0.052173 | 0.068786 | 0.053017 | -0.016613 | -0.000844 | 0.015769 |
| DLGXY | -0.534859 | -0.595160 | -0.534948 | 0.060301 | 0.000089 | -0.060212 |
| DLGQMY | -0.200054 | | -0.198305 | -0.200054 | -0.001749 | 0.198305 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.033853 | -0.027519 | -0.032588 | -0.006334 | -0.001265 | 0.005069 |
| DLGLF | -0.168740 | -0.161655 | | -0.007085 | -0.168740 | -0.161655 |
| DLGIY | 0.054572 | 0.068786 | 0.055261 | -0.014214 | -0.000689 | 0.013525 |
| DLGXY | -0.526337 | -0.595160 | -0.526051 | 0.068823 | -0.000286 | -0.069109 |
| DLGM2Y | -0.244989 | | -0.244412 | -0.244989 | -0.000577 | 0.244412 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.040619 | -0.027519 | -0.039798 | -0.013100 | -0.000821 | 0.012279 |
| DLGLF | -0.118585 | -0.161655 | | 0.043070 | -0.118585 | -0.161655 |
| DLGIY | 0.060940 | 0.068786 | 0.061366 | -0.007846 | -0.000426 | 0.007420 |
| DLGXY | -0.360568 | -0.595160 | -0.359231 | 0.234592 | -0.001337 | -0.235929 |
| DLGLLY | -0.469323 | | -0.471368 | -0.469323 | 0.002045 | 0.471368 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039514 | -0.027519 | -0.037840 | -0.011995 | -0.001674 | 0.010321 |
| DLGLF | -0.213713 | -0.161655 | | -0.052058 | -0.213713 | -0.161655 |
| DLGIY | 0.037904 | 0.068786 | 0.038969 | -0.030882 | -0.001065 | 0.029817 |
| DLGXY | -0.436532 | -0.595160 | -0.437180 | 0.158628 | 0.000648 | -0.157980 |
| DLGDCY | -0.430225 | | -0.426929 | -0.430225 | -0.003296 | 0.426929 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.035662 | -0.027519 | -0.035321 | -0.008143 | -0.000341 | 0.007802 |
| DLGLF | -0.062227 | -0.161655 | | 0.099428 | -0.062227 | -0.161655 |
| DLGIY | 0.077256 | 0.068786 | 0.077607 | 0.008470 | -0.000351 | -0.008821 |
| DLGXY | -0.521156 | -0.595160 | -0.519994 | 0.074004 | -0.001162 | -0.075166 |
| DLGPCY | -0.248458 | | -0.251813 | -0.248458 | 0.003355 | 0.251813 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039362 | -0.027519 | -0.038212 | -0.011843 | -0.001150 | 0.010693 |
| DLGLF | -0.156260 | -0.161655 | | 0.005395 | -0.156260 | -0.161655 |
| DLGIY | 0.067120 | 0.068786 | 0.067725 | -0.001666 | -0.000605 | 0.001061 |
| DLGXY | -0.333634 | -0.595160 | -0.333044 | 0.261526 | -0.000590 | -0.262116 |
| DLGDFAY | -0.512599 | | -0.512941 | -0.512599 | 0.000342 | 0.512941 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039878 | -0.027519 | -0.038770 | -0.012359 | -0.001108 | 0.011251 |
| DLGLF | -0.152185 | -0.161655 | | 0.009470 | -0.152185 | -0.161655 |
| DLGIY | 0.061653 | 0.068786 | 0.062232 | -0.007133 | -0.000579 | 0.006554 |
| DLGXY | -0.401066 | -0.595160 | -0.400348 | 0.194094 | -0.000718 | -0.194812 |
| DLGTFAY | -0.408439 | | -0.409096 | -0.408439 | 0.000657 | 0.409096 |

Addendum 10

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE GDP GROWTH RATE (1991–1996) AND RESPECTIVELY THE DEPENDENT DLGY VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGLF, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| DLGY = | DLGY = | DLGY = | | | | |
| C | -0.030997 | -0.027519 | -0.043703 | -0.003478 | 0.012706 | 0.016184 |
| DLGLF | -0.180124 | -0.161655 | -0.181493 | -0.018469 | 0.001369 | 0.019838 |
| DLGIY | 0.052173 | 0.068786 | -0.144804 | -0.016613 | 0.196977 | 0.213590 |
| DLGXY | -0.534859 | -0.595160 | | 0.060301 | -0.534859 | -0.595160 |
| DLGQMY | -0.200054 | | -0.361784 | -0.200054 | 0.161730 | 0.361784 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.033853 | -0.027519 | -0.047927 | -0.006334 | 0.014074 | 0.020408 |
| DLGLF | -0.168740 | -0.161655 | -0.160196 | -0.007085 | -0.008544 | -0.001459 |
| DLGIY | 0.054572 | 0.068786 | -0.136112 | -0.014214 | 0.190684 | 0.204898 |
| DLGXY | -0.526337 | -0.595160 | | 0.068823 | -0.526337 | -0.595160 |
| DLGM2Y | -0.244989 | | -0.411978 | -0.244989 | 0.166989 | 0.411978 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.040619 | -0.027519 | -0.052182 | -0.013100 | 0.011563 | 0.024663 |
| DLGLF | -0.118585 | -0.161655 | -0.089987 | 0.043070 | -0.028598 | -0.071668 |
| DLGIY | 0.060940 | 0.068786 | -0.034211 | -0.007846 | 0.095151 | 0.102997 |
| DLGXY | -0.360568 | -0.595160 | | 0.234592 | -0.360568 | -0.595160 |
| DLGLLY | -0.469323 | | -0.707546 | -0.469323 | 0.238223 | 0.707546 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039514 | -0.027519 | -0.052113 | -0.011995 | 0.012599 | 0.024594 |
| DLGLF | -0.213713 | -0.161655 | -0.225481 | -0.052058 | 0.011768 | 0.063826 |
| DLGIY | 0.037904 | 0.068786 | -0.114603 | -0.030882 | 0.152507 | 0.183389 |
| DLGXY | -0.436532 | -0.595160 | | 0.158628 | -0.436532 | -0.595160 |
| DLGDCY | -0.430225 | | -0.612603 | -0.430225 | 0.182378 | 0.612603 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.035662 | -0.027519 | -0.051577 | -0.008143 | 0.015915 | 0.024058 |
| DLGLF | -0.062227 | -0.161655 | 0.030196 | 0.099428 | -0.092423 | -0.191851 |
| DLGIY | 0.077256 | 0.068786 | -0.090369 | 0.008470 | 0.167625 | 0.159155 |
| DLGXY | -0.521156 | -0.595160 | | 0.074004 | -0.521156 | -0.595160 |
| DLGPCY | -0.248458 | | -0.447211 | -0.248458 | 0.198753 | 0.447211 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039362 | -0.027519 | -0.049162 | -0.011843 | 0.009800 | 0.021643 |
| DLGLF | -0.156260 | -0.161655 | -0.147831 | 0.005395 | -0.008429 | -0.013824 |
| DLGIY | 0.067120 | 0.068786 | -0.014024 | -0.001666 | 0.081144 | 0.082810 |
| DLGXY | -0.333634 | -0.595160 | | 0.261526 | -0.333634 | -0.595160 |
| DLGDFAY | -0.512599 | | -0.749245 | -0.512599 | 0.236646 | 0.749245 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | -0.039878 | -0.027519 | -0.053361 | -0.012359 | 0.013483 | 0.025842 |
| DLGLF | -0.152185 | -0.161655 | -0.138432 | 0.009470 | -0.013753 | -0.023223 |
| DLGIY | 0.061653 | 0.068786 | -0.047906 | -0.007133 | 0.109559 | 0.116692 |
| DLGXY | -0.401066 | -0.595160 | | 0.194094 | -0.401066 | -0.595160 |
| DLGTFAY | -0.408439 | | -0.666892 | -0.408439 | 0.258453 | 0.666892 |

**Addendum 11**

**TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE PER CAPITA GDP GROWTH RATE (1991–1996) AND RESPECTIVELY THE DEPENDENT DLGYC VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGLF AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$**

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| DLGYC = | DLGYC = | DLGYC = | | | | |
| C | -0.029430 | -0.025973 | -0.030700 | -0.003457 | 0.001270 | 0.004727 |
| DLGLF | -0.188809 | -0.170449 | -0.193313 | -0.018360 | 0.004504 | 0.022864 |
| DLGIY | 0.051806 | 0.068322 | | -0.016516 | 0.051806 | 0.068322 |
| DLGXY | -0.535028 | -0.594936 | -0.497938 | 0.059908 | -0.037090 | -0.096998 |
| DLGQMY | -0.198883 | | -0.207278 | -0.198883 | 0.008395 | 0.207278 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.032282 | -0.025973 | -0.033643 | -0.006309 | 0.001361 | 0.007670 |
| DLGLF | -0.177506 | -0.170449 | -0.181629 | -0.007057 | 0.004123 | 0.011180 |
| DLGIY | 0.054163 | 0.068322 | | -0.014159 | 0.054163 | 0.068322 |
| DLGXY | -0.526378 | -0.594936 | -0.488077 | 0.068558 | -0.038301 | -0.106859 |
| DLGM2Y | -0.244046 | | -0.250973 | -0.244046 | 0.006927 | 0.250973 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.039030 | -0.025973 | -0.040458 | -0.013057 | 0.001428 | 0.014485 |
| DLGLF | -0.127518 | -0.170449 | -0.131600 | 0.042931 | 0.004082 | -0.038849 |
| DLGIY | 0.060501 | 0.068322 | | -0.007821 | 0.060501 | 0.068322 |
| DLGXY | -0.361100 | -0.594936 | -0.318442 | 0.233836 | -0.042658 | -0.276494 |
| DLGLLY | -0.467810 | | -0.471382 | -0.467810 | 0.003572 | 0.471382 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.037923 | -0.025973 | -0.038917 | -0.011950 | 0.000994 | 0.012944 |
| DLGLF | -0.222318 | -0.170449 | -0.225797 | -0.051869 | 0.003479 | 0.055348 |
| DLGIY | 0.037552 | 0.068322 | | -0.030770 | 0.037552 | 0.068322 |
| DLGXY | -0.436884 | -0.594936 | -0.409445 | 0.158052 | -0.027439 | -0.185491 |
| DLGDCY | -0.428662 | | -0.435050 | -0.428662 | 0.006388 | 0.435050 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.034037 | -0.025973 | -0.035497 | -0.008064 | 0.001460 | 0.009524 |
| DLGLF | -0.071973 | -0.170449 | -0.080252 | 0.098476 | 0.008279 | -0.090197 |
| DLGIY | 0.076710 | 0.068322 | | 0.008388 | 0.076710 | 0.068322 |
| DLGXY | -0.521640 | -0.594936 | -0.471931 | 0.073296 | -0.049709 | -0.123005 |
| DLGPCY | -0.246079 | | -0.239334 | -0.246079 | -0.006745 | 0.239334 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.037778 | -0.025973 | -0.039263 | -0.011805 | 0.001485 | 0.013290 |
| DLGLF | -0.165071 | -0.170449 | -0.169926 | 0.005378 | 0.004855 | -0.000523 |
| DLGIY | 0.066660 | 0.068322 | | -0.001662 | 0.066660 | 0.068322 |
| DLGXY | -0.334241 | -0.594936 | -0.288733 | 0.260695 | -0.045508 | -0.306203 |
| DLGDFAY | -0.510970 | | -0.511816 | -0.510970 | 0.000846 | 0.511816 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.038289 | -0.025973 | -0.039747 | -0.012316 | 0.001458 | 0.013774 |
| DLGLF | -0.161011 | -0.170449 | -0.165386 | 0.009438 | 0.004375 | -0.005063 |
| DLGIY | 0.061212 | 0.068322 | | -0.007110 | 0.061212 | 0.068322 |
| DLGXY | -0.401496 | -0.594936 | -0.358370 | 0.193440 | -0.043126 | -0.236566 |
| DLGTFAY | -0.407060 | | -0.410800 | -0.407060 | 0.003740 | 0.410800 |

Addendum 12

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE PER CAPITA GDP GROWTH RATE (1991–1996) AND RESPECTIVELY THE DEPENDENT DLGYC VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_1$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| DLGYC = | DLGYC = | DLGYC = | | | | |
| C | -0.029430 | -0.025973 | -0.028000 | -0.003457 | -0.001430 | 0.002027 |
| DLGLF | -0.188809 | -0.170449 | | -0.018360 | -0.188809 | -0.170449 |
| DLGIY | 0.051806 | 0.068322 | 0.052691 | -0.016516 | -0.000885 | 0.015631 |
| DLGXY | -0.535028 | -0.594936 | -0.535078 | 0.059908 | 0.000050 | -0.059858 |
| DLGQMY | -0.198883 | | -0.197049 | -0.198883 | -0.001834 | 0.197049 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.032282 | -0.025973 | -0.030951 | -0.006309 | -0.001331 | 0.004978 |
| DLGLF | -0.177506 | -0.170449 | | -0.007057 | -0.177506 | -0.170449 |
| DLGIY | 0.054163 | 0.068322 | 0.054887 | -0.014159 | -0.000724 | 0.013435 |
| DLGXY | -0.526378 | -0.594936 | -0.526076 | 0.068558 | -0.000302 | -0.068860 |
| DLGM2Y | -0.244046 | | -0.243439 | -0.244046 | -0.000607 | 0.243439 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.039030 | -0.025973 | -0.038147 | -0.013057 | -0.000883 | 0.012174 |
| DLGLF | -0.127518 | -0.170449 | | 0.042931 | -0.127518 | -0.170449 |
| DLGIY | 0.060501 | 0.068322 | 0.060959 | -0.007821 | -0.000458 | 0.007363 |
| DLGXY | -0.361100 | -0.594936 | -0.359662 | 0.233836 | -0.001438 | -0.235274 |
| DLGLLY | -0.467810 | | -0.470009 | -0.467810 | 0.002199 | 0.470009 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.037923 | -0.025973 | -0.037840 | -0.011950 | -0.000083 | 0.011867 |
| DLGLF | -0.222318 | -0.170449 | | -0.051869 | -0.222318 | -0.170449 |
| DLGIY | 0.037552 | 0.068322 | 0.038969 | -0.030770 | -0.001417 | 0.029353 |
| DLGXY | -0.436884 | -0.594936 | -0.437180 | 0.158052 | 0.000296 | -0.157756 |
| DLGDCY | -0.428662 | | -0.426929 | -0.428662 | -0.001733 | 0.426929 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.034037 | -0.025973 | -0.033642 | -0.008064 | -0.000395 | 0.007669 |
| DLGLF | -0.071973 | -0.170449 | | 0.098476 | -0.071973 | -0.170449 |
| DLGIY | 0.076710 | 0.068322 | 0.077116 | 0.008388 | -0.000406 | -0.008794 |
| DLGXY | -0.521640 | -0.594936 | -0.520296 | 0.073296 | -0.001344 | -0.074640 |
| DLGPCY | -0.246079 | | -0.249960 | -0.246079 | 0.003881 | 0.249960 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.037778 | -0.025973 | -0.036562 | -0.011805 | -0.001216 | 0.010589 |
| DLGLF | -0.165071 | -0.170449 | | 0.005378 | -0.165071 | -0.170449 |
| DLGIY | 0.066660 | 0.068322 | 0.067300 | -0.001662 | -0.000640 | 0.001022 |
| DLGXY | -0.334241 | -0.594936 | -0.333617 | 0.260695 | -0.000624 | -0.261319 |
| DLGDFAY | -0.510970 | | -0.511331 | -0.510970 | 0.000361 | 0.511331 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.038289 | -0.025973 | -0.037117 | -0.012316 | -0.001172 | 0.011144 |
| DLGLF | -0.161011 | -0.170449 | | 0.009438 | -0.161011 | -0.170449 |
| DLGIY | 0.061212 | 0.068322 | 0.061825 | -0.007110 | -0.000613 | 0.006497 |
| DLGXY | -0.401496 | -0.594936 | -0.400737 | 0.193440 | -0.000759 | -0.194199 |
| DLGTFAY | -0.407060 | | -0.407756 | -0.407060 | 0.000696 | 0.407756 |

**Addendum 13**

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE PER CAPITA GDP GROWTH RATE (1991–1996) AND RESPECTIVELY THE DEPENDENT DLGYC VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGLF, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.029430 | -0.025973 | -0.042139 | -0.003457 | 0.012709 | 0.016166 |
| DLGLF | -0.188809 | -0.170449 | -0.190179 | -0.018360 | 0.001370 | 0.019730 |
| DLGIY | 0.051806 | 0.068322 | -0.145218 | -0.016516 | 0.197024 | 0.213540 |
| DLGXY | -0.535028 | -0.594936 | | 0.059908 | -0.535028 | -0.594936 |
| DLGQMY | -0.198883 | | -0.360651 | -0.198883 | 0.161768 | 0.360651 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.032282 | -0.025973 | -0.046357 | -0.006309 | 0.014075 | 0.020384 |
| DLGLF | -0.177506 | -0.170449 | -0.168962 | -0.007057 | -0.008544 | -0.001487 |
| DLGIY | 0.054163 | 0.068322 | -0.136536 | -0.014159 | 0.190699 | 0.204858 |
| DLGXY | -0.526378 | -0.594936 | | 0.068558 | -0.526378 | -0.594936 |
| DLGM2Y | -0.244046 | | -0.411047 | -0.244046 | 0.167001 | 0.411047 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.039030 | -0.025973 | -0.050610 | -0.013057 | 0.011580 | 0.024637 |
| DLGLF | -0.127518 | -0.170449 | -0.098878 | 0.042931 | -0.028640 | -0.071571 |
| DLGIY | 0.060501 | 0.068322 | -0.034791 | -0.007821 | 0.095292 | 0.103113 |
| DLGXY | -0.361100 | -0.594936 | | 0.233836 | -0.361100 | -0.594936 |
| DLGLLY | -0.467810 | | -0.706385 | -0.467810 | 0.238575 | 0.706385 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.037923 | -0.025973 | -0.050533 | -0.011950 | 0.012610 | 0.024560 |
| DLGLF | -0.222318 | -0.170449 | -0.234095 | -0.051869 | 0.011777 | 0.063646 |
| DLGIY | 0.037552 | 0.068322 | -0.115078 | -0.030770 | 0.152630 | 0.183400 |
| DLGXY | -0.436884 | -0.594936 | | 0.158052 | -0.436884 | -0.594936 |
| DLGDCY | -0.428662 | | -0.611187 | -0.428662 | 0.182525 | 0.611187 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.034037 | -0.025973 | -0.049967 | -0.008064 | 0.015930 | 0.023994 |
| DLGLF | -0.071973 | -0.170449 | 0.020536 | 0.098476 | -0.092509 | -0.190985 |
| DLGIY | 0.076710 | 0.068322 | -0.091070 | 0.008388 | 0.167780 | 0.159392 |
| DLGXY | -0.521640 | -0.594936 | | 0.073296 | -0.521640 | -0.594936 |
| DLGPCY | -0.246079 | | -0.445017 | -0.246079 | 0.198938 | 0.445017 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.037778 | -0.025973 | -0.047596 | -0.011805 | 0.009818 | 0.021623 |
| DLGLF | -0.165071 | -0.170449 | -0.156627 | 0.005378 | -0.008444 | -0.013822 |
| DLGIY | 0.066660 | 0.068322 | -0.014631 | -0.001662 | 0.081291 | 0.082953 |
| DLGXY | -0.334241 | -0.594936 | | 0.260695 | -0.334241 | -0.594936 |
| DLGDFAY | -0.510970 | | -0.748046 | -0.510970 | 0.237076 | 0.748046 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | -0.038289 | -0.025973 | -0.051787 | -0.012316 | 0.013498 | 0.025814 |
| DLGLF | -0.161011 | -0.170449 | -0.147243 | 0.009438 | -0.013768 | -0.023206 |
| DLGIY | 0.061212 | 0.068322 | -0.048464 | -0.007110 | 0.109676 | 0.116786 |
| DLGXY | -0.401496 | -0.594936 | | 0.193440 | -0.401496 | -0.594936 |
| DLGTFAY | -0.407060 | | -0.665791 | -0.407060 | 0.258731 | 0.665791 |

**Addendum 14**

## JOHANSEN'S CO-INTEGRATION TEST BETWEEN THE GDP, INVESTMENTS, EMPLOYMENT, FOREIGN TRADE, AND FINANCIAL DEVELOPMENT (1997–2006)

| Independent Variables | $H_0$ $H_1$ | trace statistics | critical value at 5 per cent | proba-bility** | Max-Eigen statistics | critical value at 5 per cent | proba-bility** |
|---|---|---|---|---|---|---|---|
| DLGY, | r = 0* | 174.89430 | 47.85613 | 0.0000 | 84.14922 | 27.58434 | 0.0000 |
| DLGLF, | r <= 1* | 90.74508 | 29.79707 | 0.0000 | 51.69979 | 21.13162 | 0.0000 |
| DLGIY, | r <= 2* | 39.04529 | 15.49471 | 0.0000 | 21.00221 | 14.26460 | 0.0037 |
| DLGXY | r <= 3* | 18.04308 | 3.84147 | 0.0000 | 18.04308 | 3.84147 | 0.0000 |
| DLGY, | r = 0* | 204.00250 | 69.81889 | 0.0000 | 89.61744 | 33.87687 | 0.0000 |
| DLGLF, | r <= 1* | 114.38500 | 47.85613 | 0.0000 | 56.00776 | 27.58434 | 0.0000 |
| DLGIY, | r <= 2* | 58.37726 | 29.79707 | 0.0000 | 24.45615 | 21.13162 | 0.0164 |
| DLGXY | r <= 3* | 33.92111 | 15.49471 | 0.0000 | 21.32228 | 14.26460 | 0.0033 |
| DLGQMY, | r <= 4* | 12.59882 | 3.84147 | 0.0004 | 12.59882 | 3.84147 | 0.0004 |
| DLGY, | r = 0* | 216.41930 | 69.81889 | 0.0000 | 84.92593 | 33.87687 | 0.0000 |
| DLGLF, | r <= 1* | 131.49340 | 47.85613 | 0.0000 | 66.88743 | 27.58434 | 0.0000 |
| DLGIY, | r <= 2* | 64.60598 | 29.79707 | 0.0000 | 27.88725 | 21.13162 | 0.0048 |
| DLGXY | r <= 3* | 36.71873 | 15.49471 | 0.0000 | 20.98845 | 14.26460 | 0.0037 |
| DLGM2Y, | r <= 4* | 15.73028 | 3.84147 | 0.0001 | 15.73028 | 3.84147 | 0.0001 |
| DLGY, | r = 0* | 216.76320 | 69.81889 | 0.0000 | 85.28663 | 33.87687 | 0.0000 |
| DLGLF, | r <= 1* | 131.47660 | 47.85613 | 0.0000 | 63.67162 | 27.58434 | 0.0000 |
| DLGIY, | r <= 2* | 67.80499 | 29.79707 | 0.0000 | 30.63530 | 21.13162 | 0.0017 |
| DLGXY | r <= 3* | 37.16969 | 15.49471 | 0.0000 | 20.70910 | 14.26460 | 0.0042 |
| DLGLLY, | r <= 4* | 16.46059 | 3.84147 | 0.0000 | 16.46059 | 3.84147 | 0.0000 |
| DLGY, | r = 0* | 203.80680 | 69.81889 | 0.0000 | 84.61973 | 33.87687 | 0.0000 |
| DLGLF, | r <= 1* | 119.18710 | 47.85613 | 0.0000 | 62.88927 | 27.58434 | 0.0000 |
| DLGIY, | r <= 2* | 56.29782 | 29.79707 | 0.0000 | 25.21744 | 21.13162 | 0.0126 |
| DLGXY | r <= 3* | 31.08038 | 15.49471 | 0.0001 | 19.90099 | 14.26460 | 0.0058 |
| DLGDCY | r <= 4* | 11.17939 | 3.84147 | 0.0008 | 11.17939 | 3.84147 | 0.0008 |
| DLGY, | r = 0* | 203.09870 | 69.81889 | 0.0000 | 84.38339 | 33.87687 | 0.0000 |
| DLGLF, | r <= 1* | 118.71530 | 47.85613 | 0.0000 | 60.25903 | 27.58434 | 0.0000 |
| DLGIY, | r <= 2* | 58.45623 | 29.79707 | 0.0000 | 28.13632 | 21.13162 | 0.0044 |
| DLGXY | r <= 3* | 30.31991 | 15.49471 | 0.0002 | 18.88738 | 14.26460 | 0.0086 |
| DLGPCY | r <= 4* | 11.43253 | 3.84147 | 0.0007 | 11.43253 | 3.84147 | 0.0007 |
| DLGY, | r = 0* | 205.64610 | 69.81889 | 0.0000 | 84.60961 | 33.87687 | 0.0000 |
| DLGLF, | r <= 1* | 121.03650 | 47.85613 | 0.0000 | 64.00457 | 27.58434 | 0.0000 |
| DLGIY, | r <= 2* | 57.03194 | 29.79707 | 0.0000 | 27.75899 | 21.13162 | 0.0050 |
| DLGXY | r <= 3* | 29.27295 | 15.49471 | 0.0002 | 19.25175 | 14.26460 | 0.0075 |
| DLGDFAY | r <= 4* | 10.02119 | 3.84147 | 0.0015 | 10.02119 | 3.84147 | 0.0015 |
| DLGY, | r = 0* | 205.76680 | 69.81889 | 0.0000 | 84.58053 | 33.87687 | 0.0000 |
| DLGLF, | r <= 1* | 121.18620 | 47.85613 | 0.0000 | 58.29429 | 27.58434 | 0.0000 |
| DLGIY, | r <= 2* | 62.89195 | 29.79707 | 0.0000 | 25.45438 | 21.13162 | 0.0116 |
| DLGXY | r <= 3* | 37.43757 | 15.49471 | 0.0000 | 20.06881 | 14.26460 | 0.0054 |
| DLGTFAY | r <= 4* | 17.36875 | 3.84147 | 0.0000 | 17.36875 | 3.84147 | 0.0000 |

$H_0$ – zero hypothesis for the absence of a long-term causality

$H_1$ – single hypothesis for the presence of a long-term causality

* marks the rejection of the hypothesis for the absence of long-term causality at a probability level of 0.05

** – p-values of McKinnon, Hoge, and Mischellis (1999)

**Remark:** The criss-crossed combinations of variables indicate co-integration dependencies at a 5 per cent and a 10 per cent level of statistical significance.

**Addendum 15**

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE GDP GROWTH RATE (1997–2006) AND RESPECTIVELY THE DEPENDENT DLGY VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGLF AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.013931 | 0.013057 | 0.007244 | 0.000874 | 0.006687 | 0.005813 |
| DLGLF | 0.145971 | 0.209072 | 0.489997 | -0.063101 | -0.344026 | -0.280925 |
| DLGIY | 0.237026 | 0.756991 | | -0.519965 | 0.237026 | 0.756991 |
| DLGXY | 0.036977 | 0.006223 | -0.028419 | 0.030754 | 0.065396 | 0.034642 |
| DLGQMY | -0.109748 | | 0.179061 | -0.109748 | -0.288809 | -0.179061 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.015116 | 0.013057 | 0.007848 | 0.002059 | 0.007268 | 0.005209 |
| DLGLF | 0.202429 | 0.209072 | 0.443791 | -0.006643 | -0.241362 | -0.234719 |
| DLGIY | 0.398028 | 0.756991 | | -0.358963 | 0.398028 | 0.756991 |
| DLGXY | -0.006086 | 0.006223 | -0.039424 | -0.012309 | 0.033338 | 0.045647 |
| DLGM2Y | -0.135597 | | 0.169342 | -0.135597 | -0.304939 | -0.169342 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.015339 | 0.013057 | 0.010830 | 0.002282 | 0.004509 | 0.002227 |
| DLGLF | 0.289136 | 0.209072 | 0.376563 | 0.080064 | -0.087427 | -0.167491 |
| DLGIY | 0.383950 | 0.756991 | | -0.373041 | 0.383950 | 0.756991 |
| DLGXY | 0.002317 | 0.006223 | -0.055146 | -0.003906 | 0.057463 | 0.061369 |
| DLGLLY | -0.154196 | | 0.096090 | -0.154196 | -0.250286 | -0.096090 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.013883 | 0.013057 | 0.013114 | 0.000826 | 0.000769 | -0.000057 |
| DLGLF | 0.320647 | 0.209072 | 0.536315 | 0.111575 | -0.215668 | -0.327243 |
| DLGIY | 0.510863 | 0.756991 | | -0.246128 | 0.510863 | 0.756991 |
| DLGXY | -0.035282 | 0.006223 | -0.043554 | -0.041505 | 0.008272 | 0.049777 |
| DLGDCY | -0.061944 | | -0.089391 | -0.061944 | 0.027447 | 0.089391 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.010506 | 0.013057 | 0.005249 | -0.002551 | 0.005257 | 0.007808 |
| DLGLF | 0.364880 | 0.209072 | 0.168270 | 0.155808 | 0.196610 | 0.040802 |
| DLGIY | 0.574263 | 0.756991 | | -0.182728 | 0.574263 | 0.756991 |
| DLGXY | 0.142895 | 0.006223 | 0.163991 | 0.136672 | -0.021096 | -0.157768 |
| DLGPCY | 0.037356 | | 0.136906 | 0.037356 | -0.099550 | -0.136906 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.014195 | 0.013057 | 0.013636 | 0.001138 | 0.000559 | -0.000579 |
| DLGLF | 0.425542 | 0.209072 | 0.756598 | 0.216470 | -0.331056 | -0.547526 |
| DLGIY | 0.583922 | 0.756991 | | -0.173069 | 0.583922 | 0.756991 |
| DLGXY | -0.017328 | 0.006223 | -0.019979 | -0.023551 | 0.002651 | 0.026202 |
| DLGDFAY | -0.074007 | | -0.124294 | -0.074007 | 0.050287 | 0.124294 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.018927 | 0.013057 | 0.005395 | 0.005870 | 0.013532 | 0.007662 |
| DLGLF | 0.390806 | 0.209072 | 0.126442 | 0.181734 | 0.264364 | 0.082630 |
| DLGIY | 0.526757 | 0.756991 | | -0.230234 | 0.526757 | 0.756991 |
| DLGXY | 0.028962 | 0.006223 | -0.164288 | 0.022739 | 0.193250 | 0.170511 |
| DLGTFAY | -0.310774 | | 0.333378 | -0.310774 | -0.644152 | -0.333378 |

**Addendum 16**

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE GDP GROWTH RATE (1997–2006) AND RESPECTIVELY THE DEPENDENT DLGY VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.013931 | 0.013057 | 0.013999 | 0.000874 | -0.000068 | -0.000942 |
| DLGLF | 0.145971 | 0.209072 | | -0.063101 | 0.145971 | 0.209072 |
| DLGIY | 0.237026 | 0.756991 | 0.339995 | -0.519965 | -0.102969 | 0.416996 |
| DLGXY | 0.036977 | 0.006223 | 0.088297 | 0.030754 | -0.051320 | -0.082074 |
| DLGQMY | -0.109748 | | -0.121329 | -0.109748 | 0.011581 | 0.121329 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.015116 | 0.013057 | 0.018317 | 0.002059 | -0.003201 | -0.005260 |
| DLGLF | 0.202429 | 0.209072 | | -0.006643 | 0.202429 | 0.209072 |
| DLGIY | 0.398028 | 0.756991 | 0.747572 | -0.358963 | -0.349544 | 0.009419 |
| DLGXY | -0.006086 | 0.006223 | 0.118484 | -0.012309 | -0.124570 | -0.112261 |
| DLGM2Y | -0.135597 | | -0.294246 | -0.135597 | 0.158649 | 0.294246 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.015339 | 0.013057 | 0.016399 | 0.002282 | -0.001060 | -0.003342 |
| DLGLF | 0.289136 | 0.209072 | | 0.080064 | 0.289136 | 0.209072 |
| DLGIY | 0.383950 | 0.756991 | 0.848505 | -0.373041 | -0.464555 | -0.091514 |
| DLGXY | 0.002317 | 0.006223 | 0.111047 | -0.003906 | -0.108730 | -0.104824 |
| DLGLLY | -0.154196 | | -0.193634 | -0.154196 | 0.039438 | 0.193634 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.013883 | 0.013057 | 0.013029 | 0.000826 | 0.000854 | 0.000028 |
| DLGLF | 0.320647 | 0.209072 | | 0.111575 | 0.320647 | 0.209072 |
| DLGIY | 0.510863 | 0.756991 | 0.864279 | -0.246128 | -0.353416 | -0.107288 |
| DLGXY | -0.035282 | 0.006223 | -0.014528 | -0.041505 | -0.020754 | 0.020751 |
| DLGDCY | -0.061944 | | 0.026326 | -0.061944 | -0.088270 | -0.026326 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.010506 | 0.013057 | 0.005022 | -0.002551 | 0.005484 | 0.008035 |
| DLGLF | 0.364880 | 0.209072 | | 0.155808 | 0.364880 | 0.209072 |
| DLGIY | 0.574263 | 0.756991 | 0.934786 | -0.182728 | -0.360523 | -0.177795 |
| DLGXY | 0.142895 | 0.006223 | 0.270828 | 0.136672 | -0.127933 | -0.264605 |
| DLGPCY | 0.037356 | | 0.191389 | 0.037356 | -0.154033 | -0.191389 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.014195 | 0.013057 | 0.012963 | 0.001138 | 0.001232 | 0.000094 |
| DLGLF | 0.425542 | 0.209072 | | 0.216470 | 0.425542 | 0.209072 |
| DLGIY | 0.583922 | 0.756991 | 1.018729 | -0.173069 | -0.434807 | -0.261738 |
| DLGXY | -0.017328 | 0.006223 | 0.004808 | -0.023551 | -0.022136 | 0.001415 |
| DLGDFAY | -0.074007 | | 0.042046 | -0.074007 | -0.116053 | -0.042046 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.018927 | 0.013057 | 0.022759 | 0.005870 | -0.003832 | -0.009702 |
| DLGLF | 0.390806 | 0.209072 | | 0.181734 | 0.390806 | 0.209072 |
| DLGIY | 0.526757 | 0.756991 | 1.049673 | -0.230234 | -0.522916 | -0.292682 |
| DLGXY | 0.028962 | 0.006223 | 0.156421 | 0.022739 | -0.127459 | -0.150198 |
| DLGTFAY | -0.310774 | | -0.479821 | -0.310774 | 0.169047 | 0.479821 |

Addendum 17

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE GDP GROWTH RATE (1997–2006) AND RESPECTIVELY THE DEPENDENT DLGY VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGLF, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.013931 | 0.013057 | 0.012850 | 0.000874 | 0.001081 | 0.000207 |
| DLGLF | 0.145971 | 0.209072 | 0.207738 | -0.063101 | -0.061767 | 0.001334 |
| DLGIY | 0.237026 | 0.756991 | 0.248226 | -0.519965 | -0.011200 | 0.508765 |
| DLGXY | 0.036977 | 0.006223 | | 0.030754 | 0.036977 | 0.006223 |
| DLGQMY | -0.109748 | | -0.047260 | -0.109748 | -0.062488 | 0.047260 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.015116 | 0.013057 | 0.012619 | 0.002059 | 0.002497 | 0.000438 |
| DLGLF | 0.202429 | 0.209072 | 0.229590 | -0.006643 | -0.027161 | -0.020518 |
| DLGIY | 0.398028 | 0.756991 | 0.353672 | -0.358963 | 0.044356 | 0.403319 |
| DLGXY | -0.006086 | 0.006223 | | -0.012309 | -0.006086 | 0.006223 |
| DLGM2Y | -0.135597 | | -0.026990 | -0.135597 | -0.108607 | 0.026990 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.015339 | 0.013057 | 0.012983 | 0.002282 | 0.002356 | 0.000074 |
| DLGLF | 0.289136 | 0.209072 | 0.268317 | 0.080064 | 0.020819 | -0.059245 |
| DLGIY | 0.383950 | 0.756991 | 0.362030 | -0.373041 | 0.021920 | 0.394961 |
| DLGXY | 0.002317 | 0.006223 | | -0.003906 | 0.002317 | 0.006223 |
| DLGLLY | -0.154196 | | -0.043651 | -0.154196 | -0.110545 | 0.043651 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.013883 | 0.013057 | 0.013431 | 0.000826 | 0.000452 | -0.000374 |
| DLGLF | 0.320647 | 0.209072 | 0.341221 | 0.111575 | -0.020574 | -0.132149 |
| DLGIY | 0.510863 | 0.756991 | 0.556449 | -0.246128 | -0.045586 | 0.200542 |
| DLGXY | -0.035282 | 0.006223 | | -0.041505 | -0.035282 | 0.006223 |
| DLGDCY | -0.061944 | -0.047033 | -0.061944 | -0.014911 | 0.047033 | |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.010506 | 0.013057 | 0.016990 | -0.002551 | -0.006484 | -0.003933 |
| DLGLF | 0.364880 | 0.209072 | 0.327876 | 0.155808 | 0.037004 | -0.118804 |
| DLGIY | 0.574263 | 0.756991 | 0.480981 | -0.182728 | 0.093282 | 0.276010 |
| DLGXY | 0.142895 | 0.006223 | | 0.136672 | 0.142895 | 0.006223 |
| DLGPCY | 0.037356 | | 0.021651 | 0.037356 | 0.015705 | -0.021651 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.014195 | 0.013057 | 0.013743 | 0.001138 | 0.000452 | -0.000686 |
| DLGLF | 0.425542 | 0.209072 | 0.455848 | 0.216470 | -0.030306 | -0.246776 |
| DLGIY | 0.583922 | 0.756991 | 0.553323 | -0.173069 | 0.030599 | 0.203668 |
| DLGXY | -0.017328 | 0.006223 | | -0.023551 | -0.017328 | 0.006223 |
| DLGDFAY | -0.074007 | | -0.061938 | -0.074007 | -0.012069 | 0.061938 |
| | DLGY = | DLGY = | DLGY = | | | |
| C | 0.018927 | 0.013057 | 0.011591 | 0.005870 | 0.007336 | 0.001466 |
| DLGLF | 0.390806 | 0.209072 | 0.194442 | 0.181734 | 0.196364 | 0.014630 |
| DLGIY | 0.526757 | 0.756991 | 0.447466 | -0.230234 | 0.079291 | 0.309525 |
| DLGXY | 0.028962 | 0.006223 | | 0.022739 | 0.028962 | 0.006223 |
| DLGTFAY | -0.310774 | | 0.032393 | -0.310774 | -0.343167 | -0.032393 |

**Addendum 18**

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE PER CAPITA GDP GROWTH RATE (1997–2006) AND RESPECTIVELY THE DEPENDENT DLGYC VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGLF AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE FI

| Variable Coefficients | CO–INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015234 | 0.015478 | 0.009473 | -0.000244 | 0.005761 | 0.006005 |
| DLGLF | 0.120821 | 0.159261 | 0.431414 | -0.038440 | -0.310593 | -0.272153 |
| DLGIY | 0.145044 | 0.702157 | | -0.557113 | 0.145044 | 0.702157 |
| DLGXY | -0.009331 | -0.037775 | -0.080172 | 0.028444 | 0.070841 | 0.042397 |
| DLGQMY | -0.064641 | | 0.196614 | -0.064641 | -0.261255 | -0.196614 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.017134 | 0.015478 | 0.009492 | 0.001656 | 0.007642 | 0.005986 |
| DLGLF | 0.150172 | 0.159261 | 0.413177 | -0.009089 | -0.263005 | -0.253916 |
| DLGIY | 0.365178 | 0.702157 | | -0.336979 | 0.365178 | 0.702157 |
| DLGXY | -0.047686 | -0.037775 | -0.087047 | -0.009911 | 0.039361 | 0.049272 |
| DLGM2Y | -0.115075 | | 0.214055 | -0.115075 | -0.329130 | -0.214055 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.017225 | 0.015478 | 0.012586 | 0.001747 | 0.004639 | 0.002892 |
| DLGLF | 0.227564 | 0.159261 | 0.307008 | 0.068303 | -0.079444 | -0.147747 |
| DLGIY | 0.354457 | 0.702157 | | -0.347700 | 0.354457 | 0.702157 |
| DLGXY | -0.042023 | -0.037775 | -0.112212 | -0.004248 | 0.070189 | 0.074437 |
| DLGLLY | -0.125371 | | 0.081266 | -0.125371 | -0.206637 | -0.081266 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015721 | 0.015478 | 0.015082 | 0.000243 | 0.000639 | 0.000396 |
| DLGLF | 0.166557 | 0.159261 | 0.325046 | 0.007296 | -0.158489 | -0.165785 |
| DLGIY | 0.410269 | 0.702157 | | -0.291888 | 0.410269 | 0.702157 |
| DLGXY | -0.088420 | -0.037775 | -0.107004 | -0.050645 | 0.018584 | 0.069229 |
| DLGDCY | -0.032151 | | -0.047197 | -0.032151 | 0.015046 | 0.047197 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.016870 | 0.015478 | 0.007065 | 0.001392 | 0.009805 | 0.008413 |
| DLGLF | 0.264702 | 0.159261 | 0.084947 | 0.105441 | 0.179755 | 0.074314 |
| DLGIY | 0.546009 | 0.702157 | | -0.156148 | 0.546009 | 0.702157 |
| DLGXY | 0.114745 | -0.037775 | 0.118234 | 0.152520 | -0.003489 | -0.156009 |
| DLGPCY | 0.063636 | | 0.160684 | 0.063636 | -0.097048 | -0.160684 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015974 | 0.015478 | 0.015652 | 0.000496 | 0.000322 | -0.000174 |
| DLGLF | 0.238304 | 0.159261 | 0.539632 | 0.079043 | -0.301328 | -0.380371 |
| DLGIY | 0.512282 | 0.702157 | | -0.189875 | 0.512282 | 0.702157 |
| DLGXY | -0.070324 | -0.037775 | -0.085303 | -0.032549 | 0.014979 | 0.047528 |
| DLGDFAY | -0.038189 | | -0.085324 | -0.038189 | 0.047135 | 0.085324 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.022214 | 0.015478 | 0.012067 | 0.006736 | 0.010147 | 0.003411 |
| DLGLF | 0.375576 | 0.159261 | 0.171591 | 0.216315 | 0.203985 | -0.012330 |
| DLGIY | 0.452844 | 0.702157 | | -0.249313 | 0.452844 | 0.702157 |
| DLGXY | 0.005749 | -0.037775 | -0.159116 | 0.043524 | 0.164865 | 0.121341 |
| DLGTFAY | -0.361907 | | 0.122124 | -0.361907 | -0.484031 | -0.122124 |

**Addendum 19**

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE PER CAPITA GDP GROWTH RATE (1997–2006) AND RESPECTIVELY THE DEPENDENT DLGYC VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGXY, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_I$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| DLGYC = | DLGYC = | DLGYC = | | | | |
| C | 0.015234 | 0.015478 | 0.015677 | -0.000244 | -0.000443 | -0.000199 |
| DLGLF | 0.120821 | 0.159261 | | -0.038440 | 0.120821 | 0.159261 |
| DLGIY | 0.145044 | 0.702157 | 0.388331 | -0.557113 | -0.243287 | 0.313826 |
| DLGXY | -0.009331 | -0.037775 | 0.046770 | 0.028444 | -0.056101 | -0.084545 |
| DLGQMY | -0.064641 | | -0.077990 | -0.064641 | 0.013349 | 0.077990 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.017134 | 0.015478 | 0.021567 | 0.001656 | -0.004433 | -0.006089 |
| DLGLF | 0.150172 | 0.159261 | | -0.009089 | 0.150172 | 0.159261 |
| DLGIY | 0.365178 | 0.702157 | 0.938638 | -0.336979 | -0.573460 | -0.236481 |
| DLGXY | -0.047686 | -0.037775 | 0.109441 | -0.009911 | -0.157127 | -0.147216 |
| DLGM2Y | -0.115075 | | -0.316428 | -0.115075 | 0.201353 | 0.316428 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.017225 | 0.015478 | 0.019314 | 0.001747 | -0.002089 | -0.003836 |
| DLGLF | 0.227564 | 0.159261 | | 0.068303 | 0.227564 | 0.159261 |
| DLGIY | 0.354457 | 0.702157 | 0.983502 | -0.347700 | -0.629045 | -0.281345 |
| DLGXY | -0.042023 | -0.037775 | 0.092504 | -0.004248 | -0.134527 | -0.130279 |
| DLGLLY | -0.125371 | | -0.203456 | -0.125371 | 0.078085 | 0.203456 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015721 | 0.015478 | 0.015289 | 0.000243 | 0.000432 | 0.000189 |
| DLGLF | 0.166557 | 0.159261 | | 0.007296 | 0.166557 | 0.159261 |
| DLGIY | 0.410269 | 0.702157 | 0.715595 | -0.291888 | -0.305326 | -0.013438 |
| DLGXY | -0.088420 | -0.037775 | -0.072314 | -0.050645 | -0.016106 | 0.034539 |
| DLGDCY | -0.032151 | | 0.028627 | -0.032151 | -0.060778 | -0.028627 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.016870 | 0.015478 | 0.006763 | 0.001392 | 0.010107 | 0.008715 |
| DLGLF | 0.264702 | 0.159261 | | 0.105441 | 0.264702 | 0.159261 |
| DLGIY | 0.546009 | 0.702157 | 0.994568 | -0.156148 | -0.448559 | -0.292411 |
| DLGXY | 0.114745 | -0.037775 | 0.239793 | 0.152520 | -0.125048 | -0.277568 |
| DLGPCY | 0.063636 | | 0.218764 | 0.063636 | -0.155128 | -0.218764 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015974 | 0.015478 | 0.015323 | 0.000496 | 0.000651 | 0.000155 |
| DLGLF | 0.238304 | 0.159261 | | 0.079043 | 0.238304 | 0.159261 |
| DLGIY | 0.512282 | 0.702157 | 0.944971 | -0.189875 | -0.432689 | -0.242814 |
| DLGXY | -0.070324 | -0.037775 | -0.047958 | -0.032549 | -0.022366 | 0.010183 |
| DLGDFAY | -0.038189 | | 0.047285 | -0.038189 | -0.085474 | -0.047285 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.022214 | 0.015478 | 0.026130 | 0.006736 | -0.003916 | -0.010652 |
| DLGLF | 0.375576 | 0.159261 | | 0.216315 | 0.375576 | 0.159261 |
| DLGIY | 0.452844 | 0.702157 | 1.042626 | -0.249313 | -0.589782 | -0.340469 |
| DLGXY | 0.005749 | -0.037775 | 0.119586 | 0.043524 | -0.113837 | -0.157361 |
| DLGTFAY | -0.361907 | | -0.520831 | -0.361907 | 0.158924 | 0.520831 |

**Addendum 20**

## TRANSMISSION MECHANISMS BETWEEN FINANCIAL DEVELOPMENT AND THE PER CAPITA GDP GROWTH RATE (1997–2006) AND RESPECTIVELY THE DEPENDENT DLGYC VARIABLE, THE CONSTANT INDEPENDENT VARIABLES DLGIY AND DLGLF, AND THE VARIATE INDEPENDENT FINANCIAL VARIABLE $F_1$

| Variable Coefficients | CO-INTEGRATION EQUATIONS | | | COEFFICIENT DIFFERENCES | | |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | (1–2) | (1–3) | (2–3) |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015234 | 0.015478 | 0.013625 | -0.000244 | 0.001609 | 0.001853 |
| DLGLF | 0.120821 | 0.159261 | 0.165895 | -0.038440 | -0.045074 | -0.006634 |
| DLGIY | 0.145044 | 0.702157 | -0.098834 | -0.557113 | 0.243878 | 0.800991 |
| DLGXY | -0.009331 | -0.037775 | | 0.028444 | -0.009331 | -0.037775 |
| DLGQMY | -0.064641 | | -0.026449 | -0.064641 | -0.038192 | 0.026449 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.017134 | 0.015478 | 0.013688 | 0.001656 | 0.003446 | 0.001790 |
| DLGLF | 0.150172 | 0.159261 | 0.190596 | -0.009089 | -0.040424 | -0.031335 |
| DLGIY | 0.365178 | 0.702157 | 0.422766 | -0.336979 | -0.057588 | 0.279391 |
| DLGXY | -0.047686 | -0.037775 | | -0.009911 | -0.047686 | -0.037775 |
| DLGM2Y | -0.115075 | | 0.033444 | -0.115075 | -0.148519 | -0.033444 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.017225 | 0.015478 | 0.014243 | 0.001747 | 0.002982 | 0.001235 |
| DLGLF | 0.227564 | 0.159261 | 0.213170 | 0.068303 | 0.014394 | -0.053909 |
| DLGIY | 0.354457 | 0.702157 | 0.422021 | -0.347700 | -0.067564 | 0.280136 |
| DLGXY | -0.042023 | -0.037775 | | -0.004248 | -0.042023 | -0.037775 |
| DLGLLY | -0.125371 | | 0.007773 | -0.125371 | -0.133144 | -0.007773 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015721 | 0.015478 | 0.015023 | 0.000243 | 0.000698 | 0.000455 |
| DLGLF | 0.166557 | 0.159261 | 0.199826 | 0.007296 | -0.033269 | -0.040565 |
| DLGIY | 0.410269 | 0.702157 | 0.684105 | -0.291888 | -0.273836 | 0.018052 |
| DLGXY | -0.088420 | -0.037775 | | -0.050645 | -0.088420 | -0.037775 |
| DLGDCY | -0.032151 | | 0.004461 | -0.032151 | -0.036612 | -0.004461 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.016870 | 0.015478 | 0.012841 | 0.001392 | 0.004029 | 0.002637 |
| DLGLF | 0.264702 | 0.159261 | 0.268101 | 0.105441 | -0.003399 | -0.108840 |
| DLGIY | 0.546009 | 0.702157 | 0.414363 | -0.156148 | 0.131646 | 0.287794 |
| DLGXY | 0.114745 | -0.037775 | | 0.152520 | 0.114745 | -0.037775 |
| DLGPCY | 0.063636 | | 0.048402 | 0.063636 | 0.015234 | -0.048402 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.015974 | 0.015478 | 0.015340 | 0.000496 | 0.000634 | 0.000138 |
| DLGLF | 0.238304 | 0.159261 | 0.303071 | 0.079043 | -0.064767 | -0.143810 |
| DLGIY | 0.512282 | 0.702157 | 0.649463 | -0.189875 | -0.137181 | 0.052694 |
| DLGXY | -0.070324 | -0.037775 | | -0.032549 | -0.070324 | -0.037775 |
| DLGDFAY | -0.038189 | | -0.017192 | -0.038189 | -0.020997 | 0.017192 |
| | DLGYC = | DLGYC = | DLGYC = | | | |
| C | 0.022214 | 0.015478 | 0.012679 | 0.006736 | 0.009535 | 0.002799 |
| DLGLF | 0.375576 | 0.159261 | 0.113448 | 0.216315 | 0.262128 | 0.045813 |
| DLGIY | 0.452844 | 0.702157 | 0.536624 | -0.249313 | -0.083780 | 0.165533 |
| DLGXY | 0.005749 | -0.037775 | | 0.043524 | 0.005749 | -0.037775 |
| DLGTFAY | -0.361907 | | 0.094202 | -0.361907 | -0.456109 | -0.094202 |

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# Efficiency of Commercial Banks in Bulgaria in the Wake of EU Accession

Kiril Tochkov, Nikolay Nenovsky

Abstract. The paper examines the efficiency of Bulgarian banks and its determinants over the 1999–2007 period. The levels of technical, allocative, and cost efficiency are first estimated using a non-parametric methodology and then regressed upon a number of bank-specific, institutional, and EU-related factors. The findings indicate that foreign banks were more efficient than domestic private banks, although the gap between them narrowed over time. State-owned banks ranked last on average but their privatization resulted in efficiency gains. Capitalization, liquidity, and enterprise restructuring enhanced bank efficiency, while banking reforms had an adverse effect. The Treaty of Accession and EU membership were associated with significant efficiency improvements.

Резюме. В изследването се разглежда ефективността на българските банки и техните детерминанти през периода 1999–2007 г. Равнищата на техниката, разпределението и ефективността на разходите са оценени първо при използване на непараметрична методология и след това чрез регресия на редица специфични за банките институционални и свързани с ЕС фактори. Изводите показват, че чуждестранните банки са по-ефективни от местните частни банки, въпреки че с времето разривът между тях намалява. Държавните банки са оценени последно като средно представили се, но приватизацията им води до по-добра ефективност. Капитализацията, ликвидността и преструктурирането на предприятията подобряват банковата ефективност, докато банковите реформи имат обратен ефект. Договорът за присъединяване и членство в ЕС е свързан със значително подобряване на ефективността.

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## Contents

## 1. Introduction

The transition to a stable, well-regulated, and competitive banking system in Bulgaria has been a long and tortuous process. The legal framework for commercial banking was established soon after the introduction of market reforms in the early 1990s and led to the rapid increase in the number of private banks, the consolidation of numerous state-owned banks, and the entry of foreign banks into the market. However, the sector continued to be dominated by inefficient state-owned banks burdened with non-performing loans stemming from lending to loss-making state-owned enterprises and relying on financial support from the government. Bad governance, weak regulatory oversight, unsound credit policies, and lack of privatization efforts contributed to the deterioration of the balance sheet of the banking system culminating in a severe banking crisis and a wave of bank failures in 1996–1997. The adoption of a currency board in the aftermath of the crisis signified a fundamental change in the institutional framework of the banking sector introducing new prudential requirements for commercial banks, eliminating the soft budget constraint, and strengthening the regulatory and supervisory powers of the Bulgarian National Bank. In the first half of the 2000s, banking legislation underwent another major revision to comply with European Union (EU) banking directives in the process of EU accession. Moreover, the government initiated the privatization of state-owned banks in 1997 attracting a number of strategic foreign investors. As a result, by the time Bulgaria joined the European Union on 1 January 2007, over 80 per cent of banking assets were controlled by foreign banks and over 98 per cent were privately owned.

The objective of this paper is to estimate the efficiency of Bulgarian banks and its changes over the period between the adoption of the currency board and the membership in the EU, and to examine the impact of ownership, institutional reforms, EU accession, and bank-specific financial factors on efficiency. The issue of bank efficiency in Bulgaria deserves attention for several reasons. As the newest and least developed member state, Bulgaria is in the process of catching up with the rest of the EU. An inefficient banking system which hampers financial development and is detrimental to economic growth would undermine the process of convergence. In addition, Bulgaria is the only EU member along with Estonia and Lithuania operating a currency board that eliminates or, as in the case of Bulgaria, limits the availability of a lender of last resort to situations of systemic risk (defined regulatory trough the payment system problems) and up to the excess of foreign reserves (the so called 'banking department deposit'). This intensifies the danger of bank insolvency and a banking crisis if financial institutions are inefficient and face liquidity problems. Last but not least, the period examined in the paper wit-

nessed numerous institutional reforms of the financial system aimed at dealing with the 1996–1997 banking crisis and attaining legal and regulatory harmonization in the wake of the EU accession. The assessment of bank efficiency changes over this period can provide valuable feedback to regulators and policy-makers about the effectiveness of these reforms.

The empirical analysis is conducted in two stages. First, we employ a non-parametric methodology to estimate technical, allocative, and cost efficiency of Bulgarian banks over the 1999–2007 period. Differences in efficiency levels between state-owned, private, and foreign banks, as well as between large and small banks are explored. In addition, efficiency changes and their contribution to Total Factor Productivity (TFP) are assessed and compared over the periods preceding and following the Treaty of Accession and the EU membership. In the second stage, we use a panel-data Tobin regression model to identify the determinants of the previously estimated technical, allocative, and cost efficiency levels. A set of potential correlates of efficiency are included in the regression accounting for 1) institutional changes, such as banking reforms, privatization, and enterprise restructuring, 2) accession-related events, such as the Treaty of Accession and the EU membership, and 3) bank-specific factors related to profitability, credit risk, liquidity, and capitalization.

The paper contributes to the literature by examining the levels and determinants of bank efficiency under a currency board in a transition economy that has joined the EU. Previous studies described in the next section have included Bulgaria in their efficiency analysis but mostly in a comparative context, whereby the sample of Bulgarian banks was relatively small and separate estimates were often not reported. Our data which were obtained from the Bulgarian National Bank and carefully checked against alternative data sources includes all commercial banks operating in Bulgaria and covers almost the entire period from the introduction of the currency board to the membership in the EU. This allowed us to evaluate the impact of EU accession on bank efficiency, an issue that has not been addressed by previous research. We employed a non-parametric methodology which is only one of several possible approaches to measuring efficiency but has several decisive advantages over the alternatives. It is a data driven approach which creates a benchmark against which relative efficiency can be assessed. Furthermore, the non-parametric methodology relaxes restrictive assumptions common to the parametric analysis of efficiency, allows the decomposition of cost efficiency into technical and allocative components, and enabled us to measure the contribution of efficiency change to TFP.

Our results indicate that bank efficiency in Bulgaria improved over the

sample period, and especially after 2005. In line with the literature, foreign banks were found to be more efficient than domestic private banks, but the gap narrowed significantly in the latter years of the sample period. State-owned banks were the least efficient, but achieved efficiency gains after being privatized. Furthermore, the results show that technical efficiency change became the major driving force behind TFP in the banking sector after 2005. Capitalization, profitability, liquidity, and market share were all found to be positively correlated with efficiency. Enterprise restructuring helped banks become more efficient, whereas banking reforms had the opposite effect. The Treaty of Accession and EU membership might have contributed to efficiency improvements although more research is needed based on observations over longer periods of EU membership.

The remainder of the paper is organized as follows. The next section provides an overview of the literature on bank efficiency in transition economies. The nonparametric methodology is described in Section 3, and the data and variables used in Section 4. Section 5 summarizes the results and the final section draws conclusions.

## 2. Review of the Literature

The literature on bank efficiency in transition economies can be divided into two categories. One group of studies has focused on bank efficiency within a given transition economy, including Hungary (Hasan and Marton, 2003), the Czech Republic (Weill, 2003; Matousek and Taci, 2004), Croatia (Kraft and Tirtiroglu, 1998; Jemric and Vujcic, 2002), Poland (Nikiel and Opiela, 2002; Havrylchyk, 2006), Ukraine (Mertens and Urga, 2001), and Romania (Asaftei and Kumbhakar, 2008). The sample period of these studies mostly covers the 1990s but none of them includes the years preceding and following the first and second EU expansions in Eastern Europe in 2004 and 2007, respectively. All studies suggest that foreign-owned banks were more efficient than domestic banks although the issue seems to be more nuanced. For instance, foreign greenfield banks scored higher than domestic banks acquired by foreign owners (Havrylchyk, 2006). Moreover, foreign banks servicing foreign and business customers achieved higher cost efficiency relative to foreign banks with domestic customers which were at par with private domestic banks (Nikiel and Opiela, 2002). In contrast to privatization, the tightening of prudential requirements with respect to capital adequacy and required reserved seems to have had a negative effect on efficiency as it imposed higher costs on banks (Asaftei and Kumbhakar, 2008). As for the effect of bank size on efficiency, the evidence from most studies suggests that large banks had an advantage over small banks, although in a few cases this differ-

ence was found not to be statistically significant (Matousek and Taci, 2004; Havrylchyk, 2006).

Nenovsky, Chobanov, Mihaylova, and Koleva (2008) is the only study in this group that focuses on the efficiency of Bulgarian banks. Their results indicate that the average level of technical efficiency between 1999 and 2006 was 0.78 and increased over time. In addition, foreign banks were found to be more efficient than domestic private banks, however state-owned banks surprisingly appeared to be the most efficient group which was probably due to the limited size of the sample.

A second group of studies is comparative in nature and has estimated bank efficiency within a group of transition economies. Fries and Taci (2005) used bank data from 15 transition economies over the 1994–2001 period and found that private banks were more cost efficient than state-owned banks. In particular, privatized banks with majority foreign ownership achieved higher levels of efficiency than those with domestic ownership. Moreover, their study showed that total costs decreased during the initial stages of bank reform but rose at the more advanced stages. The 19 Bulgarian banks included in the sample had an average cost efficiency level of 0.42 which was the lowest in the entire sample. When country-specific factors were included, it rose to 0.62 which was still below the sample average.

Grigorian and Manole (2006) studied 17 transition economies over the 1995–1998 period and reported that consolidation in the banking sector and the privatization to foreign owners had a positive effect on efficiency. In addition, they found that some prudential requirements such as tighter minimum capital adequacy ratios improved efficiency, whereas others such as limits to the exposure to a single borrower did not have a statistically significant effect. Between 10 and 17 Bulgarian banks were included in the sample; however, they represented less than 30 per cent of total assets of the banking system. Nevertheless, the results indicate that their efficiency levels improved from an average of 0.55 during the banking crisis in 1996–1997 to 0.71 in 1998 making them the most efficient in Eastern Europe and the Baltics and at par with the more advanced transition economies in Central Europe.

Bonin, Hasan, and Wachtel (2005) compared profit and cost efficiency of banks in 11 transition economies over the 1996–2000 period. They found that banks controlled by an international institutional investor were the most efficient, followed by foreign banks. However, efficiency of state-owned banks was not statistically significantly different from that of private domestic banks. In addition, bank size was found to be negatively correlated with efficiency. Although the sample included 17 Bulgarian banks, their efficiency was not reported separately from the sample averages.

Yildirim and Philippatos (2007) estimated cost and profit efficiency of banks in 12 transition countries from 1993 to 2000. Their findings suggest that foreign banks were more cost-efficient but less profit-efficient relative to state-owned and private domestic banks. In addition, market concentration was found to be negatively related to efficiency, whereas bank size was associated with higher levels of efficiency. Bulgaria was not included in the sample.

Stavarek (2006) compared the technical efficiency of banks in 9 transition economies with those from Greece and Portugal over the 2001–2003 period and found that even the most efficient banking sectors in Central and Eastern Europe performed worse than the two least developed members of the EU before the expansion of 2004. However, the efficiency levels in transition economies rose significantly over the sample period with Bulgaria achieving the largest improvements in the sample. The 12 Bulgarian banks included were the least efficient in 2001 with a score of 0.32 but managed to climb to a level of 0.72 in 2003.

The analysis by Brissimis, Delis, and Papanikolaou (2008) is the only one from the group of comparative studies that includes the first two years after the 2004 EU accession of 8 transition economies. Their sample consists of 10 transition economies over the 1994–2005 period. The results indicate that bank reforms, foreign ownership, and private ownership all had a positive effect on productive efficiency. Bulgarian banks are included in the sample, although their exact number is not reported. The average productive efficiency of Bulgarian banks over the sample period was estimated at 0.71 and has remained remarkably stable. Surprisingly, productive efficiency appears to have declined in the three years following the banking crisis in 1996–1997 despite reforms and privatization.

## 3. Methodology

According to Farrell (1957)'s seminal work, the concept of efficiency encompasses two aspects of firm performance. To achieve technical efficiency, firms seek to minimize the quantities of inputs used in producing a given level of output under the assumption of constant elasticity of substitution. In addition, firms also pursue allocative efficiency by evaluating input prices and choosing a combination of inputs that minimizes the cost of production. Combined, technical and allocative efficiency provide an overall efficiency measure, often referred to in the literature as cost efficiency. In practice, the efficiency of a firm is evaluated relative to a reference point on a benchmark production frontier. The efficiency measure is a radial measure of the distance between the firm and the best-practice frontier calculated as the ratio

of actual to potential firm performance. Accordingly, a firm is considered efficient if its performance corresponds to a point on the best-practice frontier. In this case actual and potential performances are identical resulting in an efficiency score of 1. In contrast, a score of less than 1 is associated with inefficient firms located below the frontier due to their poor performance relative to their potential.

The radial measure of efficiency relies on the existence of a benchmark production frontier which is not observed in practice. Two main approaches have been developed in the literature to deal with this issue. Parametric methods, such as the Stochastic Frontier Approach (SFA), use econometric techniques to estimate a frontier and decompose the stochastic term of the regression model into an inefficiency component and random error. Non-parametric methods, such as Data Envelopment Analysis (DEA), use mathematical programming to construct a piecewise linear production frontier that envelopes the observed data points and treats all deviations from the frontier as inefficiency. In the literature on bank efficiency in transition economies, Bonin, Hasan and Wachtel (2005), Fries and Taci (2005), Hasan and Marton (2003), and Yildirim and Philippatos (2007) have used SFA, whereas Grigorian and Manole (2006), Jemric and Vujcic (2002), Stavarek (2006), and Brissimis, Delis, and Papanikolaou (2008) have opted for DEA. In this study we adopt the DEA methodology to estimate the efficiency of Bulgarian banks because the non-parametric approach allows the data to determine the form of the frontier without imposing any restriction that might misspecify the production technology. In other words, this methodology is data driven rather than based on theory. Although SFA has the advantage of taking into account random error, it requires a priori specification of the functional form of the frontier and makes assumptions about the distributional properties of the components of the stochastic term which are often violated (Greene, 1999).

At first, we estimated the technical efficiency of Bulgarian banks by solving the following input-oriented linear programming model developed by Banker, Charnes and Cooper (1984):

$$
\begin{aligned}
&\theta^* = \min_{\theta,\lambda} \theta \\
s.t.\quad &\theta x_{io} \geq \sum_{j=1}^{n} \lambda_j x_{ij} \qquad i = 1,\ldots,\mathrm{m} \\
&y_{ro} \leq \sum_{j=1}^{n} \lambda_j y_{rj} \qquad r = 1,\ldots,s \\
&e\lambda = 1 \\
&\lambda_j \geq 0,\ \forall j
\end{aligned}
\tag{1}
$$

where $x_{ij}$ and $y_{rj}$ denote the levels of the ith input and $r^{th}$ output of the $j^{th}$ bank, $j$ = 1, ..., $n$. The first two constraints require that the performance of a given bank $o$ in terms of its inputs $x_{io}$ and outputs $y_{ro}$ is located within a production possibility set defined by the envelopment of all data points. The last two constraints, where $e$ is a row vector with all elements equal to 1 and $\lambda = (\lambda_1, ..., \lambda_n)$ is a column vector with all elements non-negative, allow for variable returns to scale by imposing a convexity restriction which generates a frontier in the form of a convex hull of intersecting planes. This condition accounts for the fact that the banks in the data set do not necessarily operate at an optimal scale and ensures that an inefficient bank is compared only with banks of a similar size. The scalar $\Theta^*$ which is the optimal solution of the minimization problem in Eq. 1 represents the efficiency score of a given bank. If $\Theta^*=1$, the bank is located on the best-practice frontier and is thus efficient, whereas $0 < \Theta^* < 1$ indicates inefficiency.

To examine changes in the efficiency scores of each bank over the sample period we employed the Malmquist Index, a widely-used DEA-based measure of TFP growth. Following Färe, Grosskopf, and Zhang (1994), the Malmquist Index measuring the productivity change between periods *t* and *t+1* was defined as:

$$M = \left[ \frac{\delta_t(x_{t+1}, y_{t+1})}{\delta_t(x_t, y_t)} \times \frac{\delta_{t+1}(x_{t+1}, y_{t+1})}{\delta_{t+1}(x_t, y_t)} \right]^{1/2} \quad (2)$$

where $\delta_t$ and $\delta_{t+1}$ are the technical efficiency scores calculated using the DEA model in Eq. 1 and evaluated relative to the frontier in period *t* and *t*+1, respectively. The *TFP* growth in Eq. 2 can be decomposed into technical efficiency change (*TEC*) and technological change (*TC*) as follows:

$$TFP = TEC \times TC \quad (3)$$

Technical efficiency change measures the variation in the distance of the firm's performance to the best-practice frontier between two points of time and is given by:

$$TEC = \frac{\delta_{t+1}(x_{t+1}, y_{t+1})}{\delta_t(x_t, y_t)} \quad (4)$$

*TEC* is thus the ratio of the efficiency score in *t+1* to its level in *t* and represents a movement towards or away from the frontier. *TEC*>1 indicates that the technical efficiency of the firm is improving by [(*TEC*-1)x100] per cent as the firm catches up with the best-practice frontier. *TEC*<1 indicates a deterioration in technical efficiency resulting in a growing distance between the firm's performance and the best-practice frontier.

The second component of TFP growth is technological change which measures the shift of the best-practice frontier and can be formulated as:

$$TC = \left[ \frac{\delta_t(x_t, y_t)}{\delta_{t+1}(x_t, y_t)} \times \frac{\delta_t(x_{t+1}, y_{t+1})}{\delta_{t+1}(x_{t+1}, y_{t+1})} \right]^{1/2} \tag{5}$$

Technological change thus represents the geometric mean of two ratios. The first ratio involves the efficiency of firm performance in *t* evaluated with respect to the frontiers in *t* and *t+1*. The second ratio focuses on the efficiency of firm performance in *t+1* relative to the frontiers in *t* and *t+1*. TC>1 indicates technological innovation leading to an upward shift of the frontier, whereas *TC*<1 denotes a downward shift due to regress in frontier technology.

Next, we make use of the data on input prices and estimate the cost efficiency by solving the following linear programming model based on Farrell (1957):

$$\begin{aligned} & c_{io} x_{i0}^* = \min_{x,\lambda} \sum_{i=1}^{m} c_{io} x_{io} \\ s.t. \quad & x_{io} \geq \sum_{j=1}^{n} \lambda_j x_{ij} \qquad i = 1,..., \mathrm{m} \\ & y_{ro} \leq \sum_{j=1}^{n} \lambda_j y_{rj} \qquad r = 1,..., s \\ & \sum_{j=1}^{n} \lambda_j = 1 \\ & \lambda_j \geq 0 \end{aligned} \tag{6}$$

where the constraints, including variable returns to scale, are identical to the model in Eq. 1 but the goal is to minimize the production cost represented by the product of the input $x_{io}$ and its corresponding price $c_{io}$. The optimal solution is the input vector $x^*$ which when multiplied with the input-price vector *c* determines the minimal cost. The cost efficiency (*CE*) score for each bank is then obtained by evaluating the minimal cost $cx^*$ relative to the observed cost *cx* as follows:

$$CE = \frac{cx^*}{cx} \tag{7}$$

where $0<CE\leqslant 1$ and the bank is cost efficient only if *CE*=1. Given that cost efficiency can be decomposed into technical (*TE*) and allocative efficiency (*AE*) as follows:

$$CE = TE \times AE \tag{8}$$

we are able to estimate the *AE* by dividing the estimate from Eq. 7 by the estimate from Eq. 1. Whereas *TE* is concerned with the distance between the bank performance and the best-practice frontier, AE measures the distance between the reference point on the frontier and the cost line. Full allocative efficiency defined as *AE*=1 is achieved if a bank has an optimal combination of inputs and costs which corresponds to a location on the cost line. Consequently, full cost efficiency is attained only if a bank has perfect scores in both technical and allocative efficiency and is thus located on both the best-practice frontier and the cost line.

## 4. Data

The data set included all commercial banks in Bulgaria over the 1999–2007 period. The number of banks in each year varied between 29 and 35. Since the DEA measures the efficiency of producing multiple outputs using a set of inputs, the choice of input and output variables is of great significance for the resulting estimates. We based our selection of variables on the intermediation approach (Sealey and Lindley, 1977) which focuses on the traditional role of banks as financial intermediaries that collect deposits and convert them, using labor and capital, into loans and other earnings assets.[1] Accordingly, we defined three inputs and two outputs. The inputs included labor, capital, and borrowed funds. Labor was measured as the number of bank employees, and capital as the value of fixed assets. Borrowed funds were the sum of total deposits and short- and long-term borrowings. The two outputs were total loans and investment assets.

Data on the number of employees were provided by the Bulgarian National Bank (BNB). All other variables were collected from end-year balance sheets and income statements published by BNB in the *Commercial Banks in Bulgaria* bulletin. Nominal variables expressed in Bulgarian levs (BGN) were deflated by the consumer price index with 2005 as base year. Given that DEA efficiency estimates are sensitive to measurement errors, it was important to address the data quality issues stemming from poor accounting standards and weak regulatory supervision common to all transition economies. To reduce the possible impact of these problems we used data published by BNB, verified it against an alternative database, and focused on the later years of transition when financial reporting standards improved significantly.

[1] The alternative production approach (**Sherman and Gold**, 1985) argues that banks use labor and capital to produce loans and deposits. It justifies treating deposits as output rather than input by pointing out that transaction services provided by banks to depositors create value added as well. In the literature on bank efficiency in transition economies, the production approach has been adopted by **Grigorian and Manole** (2002) and **Fries and Taci** (2004).

The introduction of a currency board in the aftermath of the 1997 banking crisis was accompanied by the adoption of a new institutional framework which strengthened bank regulation and supervision and led to a more strict enforcement of the rules. Moreover, the rapidly increasing market share of foreign banks from member states of the EU since the late 1990s improved compliancy with international accounting principles. This process was further enhanced by the implementation of EU banking directives in the period leading up to the Treaty of Accession. Banks began adhering to the International Accounting Standards in their financial reporting in 1999 which was chosen as the first year of the sample period. In addition, we also checked the data against financial information reported in the reputable *BankScope* database that has been widely used in previous studies on banking efficiency but has a less comprehensive coverage of Bulgarian banks than the BNB data. The fact that only a few insignificant differences were found was further evidence for the high quality of the data used.

Besides input and output variables, cost efficiency analysis required also data on input prices for each bank. In line with the literature, we defined the price of borrowed funds as the ratio of interest expenses to borrowed funds, the price of labor as the ratio of personnel expenses to the number of employees, and the price of capital as the ratio of operating expenses (net of interest and personnel expenses) to fixed assets.[2] While interest expenses and operating expenses are available from the BNB bulletin, personnel expenses are not reported separately for each bank. Instead, since 2003 the BNB has been providing aggregate annual data on personnel expenses for three groups of banks arranged according to asset size and ownership. We calculated the personnel expenses as a percentage of non-interest operating expenses for each of the three groups and used these ratios to estimate the annual personnel expenses for each bank over the 2003–2007 period. Although *BankScope* reports personnel expenses by bank, they were not used because of incomplete data for some banks and years in our sample. Nevertheless, the correlation between our estimates and the actual personnel expenses available from *BankScope* for each year varied between 0.95 and 0.98.

The descriptive statistics of the input, output, and price variables are summarized in Table 1. The mean value of loans adjusted for inflation increased from BGN 215 million in 1999 to BGN 1.4 billion in 2007. The mean value of investment assets was very small in comparison (BGN 26 million in 1999) but increased rapidly over the sample period reflecting the development of capi-

[2] For the price of capital we used alternatively the ratio of operating expenses (net of interest and personnel expenses) to total assets, however this did not result in any significant changes in the cost efficiency estimates.

tal markets and investment opportunities for Bulgarian banks. The number of employees *per* bank remained relatively stable at around 630 until it rose rapidly to over 1000 in the last three years of the sample period mainly as a result of a few large-scale mergers and takeovers. The mean value of borrowed funds mirrored the magnitude and increases of loans, reaching a level of BGN 1.5 billion in 2007 from a level of BGN 271 million in 1999. The average prices of labor and capital experienced initial increases but then remained relatively stable, whereas the price of borrowed funds exhibited gradual but steady increases.

**Table 1**

**DESCRIPTIVE STATISTICS OF THE INPUT, OUTPUT, AND PRICE VARIABLES**

| Year | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of banks | | 34 | 34 | 35 | 34 | 35 | 35 | 33 | 32 | 29 |
| *Outputs* | | | | | | | | | | |
| Loans | Mean | 215 | 266 | 285 | 324 | 375 | 523 | 714 | 894 | 1369 |
| | SD | 354 | 470 | 427 | 415 | 450 | 624 | 826 | 1025 | 1645 |
| Investment | Mean | 26 | 17 | 18 | 38 | 55 | 54 | 82 | 91 | 80 |
| assets | SD | 98 | 64 | 72 | 138 | 180 | 159 | 182 | 179 | 146 |
| *Inputs* | | | | | | | | | | |
| Employees | Mean | 641 | 638 | 636 | 638 | 612 | 642 | 737 | 826 | 1054 |
| | SD | 1158 | 1105 | 1068 | 975 | 802 | 766 | 782 | 831 | 1145 |
| Fixed assets | Mean | 14 | 16 | 16 | 21 | 19 | 20 | 24 | 27 | 33 |
| | SD | 23 | 22 | 23 | 36 | 31 | 31 | 33 | 38 | 49 |
| Borrowed | Mean | 271 | 292 | 334 | 397 | 463 | 572 | 848 | 1051 | 1502 |
| funds | SD | 456 | 471 | 528 | 550 | 601 | 677 | 977 | 1192 | 1774 |
| *Input prices* | | | | | | | | | | |
| Labor | Mean | | | | | 17.2 | 18.5 | 19.0 | 18.8 | 18.7 |
| | SD | | | | | 9.6 | 10.0 | 11.8 | 11.1 | 11.0 |
| Capital | Mean | | | | | 2.4 | 2.7 | 2.3 | 3.5 | 3.5 |
| | SD | | | | | 3.2 | 3.7 | 3.3 | 6.9 | 7.7 |
| Borrowed | Mean | | | | | 2.1 | 2.2 | 2.3 | 2.4 | 2.6 |
| funds | SD | | | | | 1.1 | 1.3 | 1.1 | 0.9 | 0.6 |

**Notes:** 1. All input and output variables are measured in millions of constant 2005 BGN with the exception of the number of bank employees.

2. The price of labor is expressed in thousands of constant 2005 BGN.

3. The price of capital and of borrowed funds is measured in percentage.

The sample of banks was subdivided by ownership (state-owned, private domestic and foreign) and by size (large, medium, small). The reason for selecting these two factors was the fact that a handful of large banks have a relatively large market share and that bank privatization is a major determi-

nant of bank performance as evidenced by previous studies on transition economies.[3] The last state-owned bank of any significance was privatized in 2002 making this category obsolete in subsequent years of the sample period.[4] Banks with foreign ownership of at least 50 per cent were treated as foreign. With regard to bank size, the categories of large and small banks were defined as the upper and lower quartiles of the asset distribution in each year.[5]

**Table 2**

**MEAN ANNUAL VALUES OF THE VARIABLES BY OWNERSHIP AND SIZE, 1999–2007**

| Bank type | State-owned[a] | Private domestic | Foreign | Large | Medium | Small |
|---|---|---|---|---|---|---|
| Number of banks | 3-7 | 6-10 | 19-23 | 6-9 | 15-20 | 7-9 |
| Total assets | 784 | 494 | 880 | 2316 | 441 | 77 |
| *Outputs* | | | | | | |
| Loans | 446 | 334 | 648 | 1633 | 324 | 53 |
| Investment assets | 66 | 43 | 54 | 192 | 16 | 5 |
| *Inputs* | | | | | | |
| Employees | 1954 | 693 | 836 | 1959 | 456 | 89 |
| Fixed assets | 39 | 16 | 23 | 64 | 12 | 3 |
| Borrowed funds | 652 | 418 | 721 | 1886 | 378 | 50 |
| Input prices[b] | | | | | | |
| Labor (thousands BGN) | - | 13.4 | 21.1 | 17.1 | 19.9 | 17.2 |
| Capital (%) | - | 2.6 | 2.2 | 2.0 | 2.3 | 2.8 |
| Borrowed funds (%) | - | 3.0 | 2.1 | 2.1 | 2.5 | 2.2 |

All variables are expressed in millions of constant 2005 BGN except as noted.

[a] State-owned banks averages are for the 1999–2002 period.

[b] Input price averages are for the 2003–2007 period.

[3] Cluster analysis would have provided a more rigorous approach to the creation of subsamples, however we chose to follow the literature and use only size and ownership so as to make our results directly comparable to previous studies on transition economies, none of which employs cluster analysis. Furthermore, the factors that would have been used in a cluster analysis are included as possible determinants of efficiency in the second-stage regression in Section 5.2.

[4] Two state-owned banks continued to operate after 2002 and were included in the sample but the small number and their relatively small size were not sufficient to justify a separate category.

[5] Interestingly, despite mergers and takeovers the composition of these two groups remained extremely stable over the sample period resulting in a remarkably consistent categorization of banks by size across years.

Descriptive statistics for the six subsamples are displayed in Table 2. The dominant position of foreign banks in Bulgaria is evident from the fact that they represented two-thirds of all banks and had the highest mean annual value of assets, loans, and borrowed funds. Despite their small number, state-owned banks were close second in terms of assets over the 1999–2002 period and had the highest average values of investment assets and fixed capital. In addition, the mean number of employees was two to three times higher than that of private banks. Foreign banks had higher labor costs and lower costs for fixed capital and borrowed funds than private domestic banks. Large banks enjoyed the lowest prices for all three inputs but small banks also paid lower prices for labor and borrowed funds than medium-sized banks.

## 5. Results

### *5.1. Efficiency Estimates*

The DEA estimates are reported in Table 3 and indicate that the mean efficiency score of Bulgarian banks was 0.83 over the 1999–2007 period. From the annual estimates it is evident that there is a significant difference between the 1999–2004 and 2005–2007 periods. Whereas in the first six years of the sample period efficiency fluctuated between 0.69 and 0.84 without a clear pattern, it soared above 0.90 in 2005 and remained at this relatively high level despite minor decreases in the following years. The reason for the lower efficiency in the late 1990s and early 2000s is that most banks were reluctant to lend as they were still haunted by the aftermath of the 1996 crisis. This changed in 2004 when foreign banks were attracted by higher rates of return and the prospect of Bulgaria's EU accession, poured resources into the financial system through their Bulgarian subsidiaries creating a credit boom reflected in the jump in efficiency scores. BNB reacted by raising the reserve requirements and imposing restrictions on lending which were most likely responsible for the moderate decline in efficiency after 2005.

Foreign banks were more efficient than private domestic banks, and their score mirrored the overall pattern of change of the sample average. By contrast, private domestic banks exhibited consistent improvements in technical efficiency since 2005 thereby surpassing foreign banks in 2007. State-owned banks which were evaluated over the first four years of the sample before being privatized recorded the lowest level of technical efficiency. Moreover, their efficiency worsened over the years as the best banks were privatized first. Foreign banks were the main beneficiaries of privatization and the analysis of the four takeovers in the years 1999–2002 showed that the efficiency

of the state-owned banks involved increased on average from 0.82 to 0.90 following privatization.

Table 3

**TECHNICAL EFFICIENCY BY OWNERSHIP AND SIZE, 1999–2007**

| Year | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | N | 34 | 34 | 35 | 34 | 35 | 35 | 33 | 32 | 29 | |
| | Mean | 0.81 | 0.84 | 0.80 | 0.69 | 0.82 | 0.75 | 0.93 | 0.91 | 0.90 | 0.83 |
| | SD | 0.20 | 0.18 | 0.20 | 0.30 | 0.19 | 0.21 | 0.10 | 0.13 | 0.14 | 0.18 |
| | Min | 0.06 | 0.50 | 0.41 | 0.11 | 0.41 | 0.41 | 0.70 | 0.56 | 0.45 | 0.40 |
| State | N | 7 | 4 | 4 | 3 | | | | | | |
| | Mean | 0.87 | 0.65 | 0.74 | 0.48 | | | | | | 0.69 |
| Private | N | 8 | 9 | 10 | 10 | 10 | 10 | 9 | 7 | 6 | |
| | Mean | 0.72 | 0.77 | 0.65 | 0.52 | 0.70 | 0.59 | 0.89 | 0.90 | 0.92 | 0.74 |
| Foreign | N | 19 | 21 | 21 | 21 | 23 | 23 | 22 | 23 | 21 | |
| | Mean | 0.82 | 0.90 | 0.89 | 0.79 | 0.89 | 0.84 | 0.95 | 0.93 | 0.91 | 0.88 |
| Large | N | 8 | 9 | 9 | 8 | 7 | 7 | 6 | 7 | 7 | |
| | Mean | 0.88 | 0.83 | 0.90 | 0.95 | 1.00 | 0.92 | 1.00 | 1.00 | 1.00 | 0.94 |
| Medium | N | 19 | 16 | 17 | 19 | 20 | 20 | 19 | 18 | 15 | |
| | Mean | 0.77 | 0.77 | 0.73 | 0.76 | 0.76 | 0.68 | 0.88 | 0.88 | 0.90 | 0.79 |
| Small | N | 7 | 9 | 9 | 7 | 8 | 8 | 8 | 7 | 7 | |
| | Mean | 0.80 | 0.98 | 0.83 | 0.46 | 0.83 | 0.77 | 0.98 | 0.92 | 0.82 | 0.82 |

Large banks were found to be the most efficient subsample with an average score of 0.94. They achieved maximum efficiency in every year since 2005 and thus determined the best-practice frontier. Small banks were less efficient and experienced a decline in efficiency after reaching a peak in 2005.

The estimates of the Malmquist Index measuring changes in TFP and its components are shown in Table 4.[6] The average TFP growth rate over the 2000–2007 period was 3.7 per cent. Although technical efficiency improved by 1.4 per cent, the contribution of technological change to TFP growth was larger. A comparison between the periods before and after the Treaty of Accession revealed the same pattern found in Table 3. During the 2000–2004

[6] This type of analysis requires a balanced panel which limited the size of the sample to 25 banks. Institutions founded during the sample period or those that merged together to form a new bank were excluded.

period, technological change was the only driving force behind TFP as efficiency remained largely unchanged. This pattern was reversed after 2005 as technical efficiency increased by 4.3 per cent and was responsible for TFP growth. In the first year of EU membership TFP grew by 6 per cent but technical efficiency deteriorated.[7]

Foreign banks exhibited the largest improvement in technical efficiency and the highest growth rate of TFP over the sample period. However, private domestic banks surpassed them in both aspects in 2005–2007 by achieving technical efficiency change of over 10 per cent. State-owned banks experienced a severe decline in TFP and deterioration in technical efficiency before being privatized. Furthermore, the results suggest that TFP growth for large banks relied mostly on technical efficiency change, whereas for small banks it was almost exclusively driven by technological change due to lack of any efficiency improvements. Small banks recorded significantly higher rates of efficiency change for the 2005–2007 period but in 2007 they also experienced a steeper efficiency decline than large banks.

**Table 4**

**TFP GROWTH, TECHNICAL EFFICIENCY CHANGE, AND TECHNOLOGICAL CHANGE (IN PERCENTAGE)**

| Period | | 2000–2007 | | | 2000–2004 | | 2005–2007 | | 2007 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | *N* | *TFP* | *TEC* | *TC* | *TFP* | *TEC* | *TFP* | *TEC* | *TFP* | *TEC* |
| Sample | 25 | 3.7 | 1.4 | 2.3 | 5.0 | -0.7 | 2.0 | 4.3 | 6.0 | -7.7 |
| State* | 4 | -9.5 | -1.1 | -8.5 | | | | | | |
| Private | 8 | 0.4 | 1.3 | -0.9 | -2.4 | -4.8 | 4.4 | 10.2 | 8.0 | -9.1 |
| Foreign | 13 | 5.5 | 1.6 | 3.8 | 7.6 | 1.7 | 2.7 | 1.4 | 4.8 | -5.5 |
| Large | 5 | 4.9 | 3.3 | 1.5 | 10.6 | 4.1 | -2.4 | 2.2 | 8.7 | -3.1 |
| Medium | 14 | 1.7 | 1.3 | 0.4 | 0.0 | -1.2 | 4.3 | 4.7 | 13.1 | -0.3 |
| Small | 6 | 7.4 | 0.1 | 7.3 | 13.0 | -3.6 | 0.4 | 5.3 | -10.7 | -22.7 |

All growth rates are geometric means over the respective period and are expressed in percentage (e.g., [TFP-1]x100).

* The values for state-owned firms are geometric means over the 2000–2002 period.

[7] Although this decline in efficiency was already observed in Table 3, its magnitude might have been overestimated due to the fact that there were two large mergers in 2007 and the five involved banks were excluded from the sample for the estimation of the Malmquist Index.

Table 5 displays the estimates of cost efficiency which represents a measure of overall efficiency taking into account technical as well as allocative aspects. It is evident that when input prices were included in the analysis the average cost and allocative efficiency scores of Bulgarian banks over the 2003–2007 period became 0.63 and 0.72, respectively. Cost efficiency improved consistently over the years witnessing a larger increase in 2006 and reaching a peak of 0.78 in 2007. Foreign banks were again more cost and allocative efficient than domestic banks, however the gap between the two groups narrowed significantly, especially after domestic banks experienced a dramatic boost in efficiency in 2005. Large banks had again the highest average scores and achieved perfect efficiency in 2007. In contrast, small banks were extremely inefficient and despite some minor improvements in 2006–2007 they remained below the average efficiency level for the entire sample.

**Table 5**

**COST AND ALLOCATIVE EFFICIENCY BY OWNERSHIP AND SIZE, 2003–2007**

| Year | | 2003 | 2004 | 2005 | 2006 | 2007 | Mean |
|---|---|---|---|---|---|---|---|
| Sample | Mean (CE) | 0.53 | 0.55 | 0.59 | 0.72 | 0.78 | 0.63 |
| | SD (CE) | 0.28 | 0.29 | 0.37 | 0.25 | 0.26 | 0.29 |
| | Mean (AE) | 0.62 | 0.70 | 0.64 | 0.77 | 0.85 | 0.72 |
| | SD (AE) | 0.24 | 0.23 | 0.39 | 0.22 | 0.20 | 0.26 |
| Private domestic | CE | 0.34 | 0.34 | 0.65 | 0.65 | 0.72 | 0.54 |
| | AE | 0.49 | 0.61 | 0.75 | 0.72 | 0.76 | 0.67 |
| Foreign | CE | 0.62 | 0.66 | 0.56 | 0.76 | 0.81 | 0.68 |
| | AE | 0.68 | 0.76 | 0.59 | 0.80 | 0.87 | 0.74 |
| Large | CE | 0.88 | 0.85 | 0.96 | 0.97 | 1.00 | 0.93 |
| | AE | 0.88 | 0.92 | 0.96 | 0.97 | 1.00 | 0.95 |
| Medium | CE | 0.43 | 0.48 | 0.55 | 0.67 | 0.76 | 0.58 |
| | AE | 0.56 | 0.67 | 0.63 | 0.75 | 0.83 | 0.69 |
| Small | CE | 0.46 | 0.45 | 0.42 | 0.57 | 0.61 | 0.50 |
| | AE | 0.54 | 0.56 | 0.42 | 0.61 | 0.73 | 0.57 |

### *5.2. Determinants of Efficiency*

To identify the determinants of bank efficiency, the DEA estimates were regressed on a number of bank-specific and institutional variables using the following specification:

$$EFF_{it} = \alpha + \sum_{k} \beta_k OWN_{it,k} + \sum_{m} \beta_m CAMEL_{it,m} + \sum_{q} \beta_q INST_{t,q} + \sum_{z} \beta_z EU_{t,z} + \varepsilon_{it} \quad (9)$$

Three separate regressions were estimated with technical, cost, and allocative efficiency as the dependent variable. As DEA efficiency scores are limited to values between 0 and 1, estimation via OLS would result in inconsistent estimates. Therefore, we employed a Tobit specification for panel data which captures the lower and upper censoring of the dependent variable and produces consistent Maximum Likelihood estimates.

The potential correlates of efficiency were broadly grouped into four categories. The first addressed issues of ownership and size (*OWN*) and included dummy variables for state-owned and foreign banks as well as a variable for bank size defined as the ratio of a bank's assets to the total assets of the banking system. The second group of variables consisted of bank-specific financial indicators which are part of the *CAMEL* (Capital adequacy, Asset quality, Management, Earning, Liquidity) Rating System used by supervisory bodies, including BNB, to assess bank performance. From the numerous CAMEL indicators we selected the four most frequently used in the literature for which data were available in the *BankScope* database and the *Commercial Banks in Bulgaria* bulletin. The ratio of equity to total assets was used as a measure of bank capitalization. Asset quality was proxied by loan loss provisions as a fraction of total loans. The return on assets (ROA) was a proxy for profitability, and liquidity was measured as the share of liquid assets in total assets.
The third group of correlates (*INT*) controlled for changes in the institutional environment in which commercial banks operated. In particular, we included three variables representing progress in banking reform, large-scale privatization, and enterprise restructuring in Bulgaria. Each of the variables was measured by a composite index computed by the European Bank of Reconstruction and Development and reported in its annual *Transition Report*. The indices measure institutional development in Bulgaria relative to the standards of industrialized market economies and range from 1 (little or no change from a rigid centrally-planned economy) to 4+ (standards of an industrialized market economy). The banking reform variable assessed progress in establishing an effective framework of prudential supervision and regulation, convergence of banking laws and regulations with international standards, banking competition, lending to private enterprises, and the share of private banks. The large-scale privatization variable accounted for changes in the

share of state-owned enterprises and the effectiveness of corporate governance. Lastly, the restructuring variable focused on the transition from a soft to a hard budget constraint, the enforcement of bankruptcy legislation, new investment in enterprises, and the effectiveness of corporate control.

The fourth group of variables (EU) examined the impact of EU accession on bank efficiency. In particular, dummy variables for the years 2005 and 2007 accounted for the effects of the signing of the Treaty of Accession and EU membership, respectively.

**Table 6**

**RESULTS OF THE TOBIT REGRESSION ANALYSIS OF EFFICIENCY DETERMINANTS**

| Dependent variable | TE | CE | AE |
|---|---|---|---|
| Constant | 0.299 | -0.319 | -0.708 |
| | (0.81) | (-0.37) | (-0.88) |
| *Ownership and size* | | | |
| State-owned | -0.042 | | |
| | (-0.77) | | |
| Foreign | 0.220*** | 0.116** | 0.065 |
| | (6.43) | (2.06) | (1.22) |
| Market share | 0.028*** | 0.066*** | 0.056*** |
| | (5.42) | (6.83) | (6.18) |
| *CAMEL* | | | |
| Equity/Total assets | 0.005*** | 0.005** | 0.002 |
| | (4.64) | (2.10) | (0.85) |
| Loan loss provisions/Loans | -0.001 | 0.015 | 0.020 |
| | (-1.23) | (0.80) | (0.18) |
| ROA | 0.020*** | 0.021*** | 0.020** |
| | (3.36) | (2.35) | (2.37) |
| Liquid assets/Total assets | -0.001 | 0.003** | 0.004*** |
| | (-1.36) | (1.95) | (2.94) |
| *Institutional reforms* | | | |
| Privatization | 0.198 | | |
| | (1.50) | | |
| Banking reform | -0.457*** | 0.114 | 0.278 |
| | (-2.95) | (0.47) | (1.22) |
| Restructuring | 0.401** | | |
| | (2.22) | | |
| EU Accession | | | |
| Treaty of Accession | 0.248*** | 0.096 | -0.018 |
| | (5.12) | (1.34) | (-0.26) |
| EU Accession | -0.009 | 0.195*** | 0.218*** |
| | (-0.15) | (2.59) | (3.09) |
| Period | 1999–2007 | 2003–2007 | 2003–2007 |
| Observations | 234 | 145 | 145 |

*t*-values in parenthesis. ** 5% significance level. *** 1% significance level.

The results of the Tobit regression are presented in Table 6. The estimated coefficients of the ownership dummy variables indicate that foreign banks were significantly more cost efficient and more technically efficient than domestic banks which is consistent with the findings of previous studies on transition economies. The majority of foreign banks in Bulgaria are owned by large and established banks from Germany, France, Italy, and Austria giving them access to advanced technology and expertise, better risk management and corporate governance, and capital from their parent banks. Moreover, foreign banks have the advantage of counting foreign firms and the most creditworthy Bulgarian companies as their customers (Koford and Tscheogl, 2003). Greek and Turkish banks, for instance, followed corporate customers from their home countries on the Bulgarian market where they continued servicing their needs. Foreign corporate customers have been shown to improve cost efficiency of banks in other transition economies (Nikiel and Opiela, 2002).

State-owned banks were found to be less technically efficient than private domestic and foreign banks, which is also in line with previous research. The coefficient for state ownership reported in Table 6 is negative but not statistically significant because two major state-owned banks had to be dropped from the sample for the sake of a balanced panel dataset over the 1999–2007 period. When the model was estimated for the 1999–2003 period with all state-owned banks included, this coefficient turned significant. With respect to size, it appears that technical, cost, and allocative efficiency were higher for banks with a larger market share as they were able to benefit from lower costs and economies of scale.

The regression results reveal further that capitalization was positively related to technical and cost efficiency.[8] A possible explanation is that well-capitalized banks attract more deposits as they offer implicit deposit insurance which is reflected in lower interest expenses and thus lower total costs. Moreover, higher returns on assets were positively associated with all three types of efficiency. The coefficient for the ratio of loan loss provisions to total loans was not statistically significant for any aspect of efficiency.[9] This contradicts Yildirim and Philippatos (2007), Havrylchiyk (2006), and Brissimis et al. (2008) who reported a significantly negative relationship between the share of impaired assets and efficiency. A look at the data suggests that the subsidiaries of foreign banks in Bulgaria had an average provisions-to-loans ratio of

[8] A number of studies have reported similar results, including **Fries and Taci** (2005), **Grigorian and Manole** (2006), and **Yildirim and Philippatos** (2007).

[9] **Matousek and Taci** (2004) found an overall positive correlation between ROA and cost efficiency for the Czech Republic. They further showed that while this was also true for big and foreign banks, the correlation was negative for small banks.

only 1 per cent over the 2003–2007 period. However, the average ratio of 3.01 per cent for large foreign banks was only slightly lower than the 3.3 per cent for the rest of the banking sector. In addition, the coefficient of variation decreased over the years as the quality of the credit portfolio of less efficient banks improved.

Liquidity had a positive effect on cost and allocative efficiency.[10] Given the limited role of BNB as a lender of last resort under the currency board, commercial banks need to either maintain high liquidity or rely on short-term money markets in the case of a liquidity crisis. Keeping a larger share of liquid assets seems to be more efficient as it minimizes the costs of borrowing.

Enterprise restructuring contributed to higher levels of technical efficiency of banks. This reflects improvements in the credit portfolio of banks and an increase in their willingness to lend as a result of the hardening of the budget constraint, the risk of bankruptcy, and better corporate governance of firms. Large-scale privatization of state-owned enterprises did not significantly affect technical efficiency of banks.[11] Banking reform was negatively associated with technical efficiency but was not significantly correlated with cost and allocative efficiency. This result reflects the difference in the periods for which the regressions were estimated. Technical efficiency was analyzed over the entire sample period and thus included the 1999–2004 period when banking reforms were most intense in the aftermath of the banking crisis and in the wake of the Treaty of Accession. The regressions of cost and allocative efficiency covered the 2003–2007 period when banking reforms slowed down which explains the lack of significance of the corresponding coefficients. Our results therefore suggest that fundamental reforms of the banking system in Bulgaria involving for instance tighter reserve and liquidity requirements affected adversely bank operations and imposed costs which had a negative effect on efficiency. This finding is consistent with Fries and Taci (2005) and Asaftei and Kumbhakar (2008) but contradicts the positive relationship reported by Brissimis et al. (2008).[12]

[10] **Hasan and Marton** (2003) also showed that a higher share of liquid assets was linked to less cost inefficiencies in the case of Hungary.

[11] The indices for large-scale privatization and enterprise restructuring did nor change over the 2003–2007 period and were therefore excluded from the regressions of cost and allocative efficiency.

[12] It should be noted again that EBRD's banking reform variable measures the convergence of institutional standards in the Bulgarian banking system to those of mature market economies. A more detailed analysis of the various reform measures as conducted by **Grigorian and Manole** (2006) for a number of transition economies suggests that prudential requirements can have differing effects on efficiency.

Despite the negative relationship between efficiency and banking reforms aimed at legal and regulatory convergence with developed market economies, the EU accession appears to have boosted efficiency, although this result should be treated with caution due to the relatively short period of evaluation. The Treaty of Accession in 2005 marked a significant improvement in technical efficiency, whereas the first year of EU membership was associated with pronounced gains in cost and allocative efficiency. It is also possible that these variations in efficiency during accession and EU membership were magnified by other factors such as institutional reforms and financial indicators, as evidenced by the regression results.

## 6. Conclusions

In this paper we measured the efficiency of commercial banks in Bulgaria and examined its determinants over the 1999–2007 period. Our findings indicate that estimates for the different types of efficiency varied between 0.63 and 0.83, and improved over time, exhibiting particularly large gains in 2005. As a result, technical efficiency change replaced technological innovation as the major driving force behind TFP growth in the banking sector after 2005. Foreign banks were found to be more efficient than private domestic banks, which is consistent with previous research. However, the efficiency gains attained by private domestic banks in the 2005–2007 period helped them catch up with their foreign competitors. State-owned banks were the worst performers but their efficiency recovered following their privatization and restructuring.

Furthermore, our analysis identified a number of financial, institutional, and EU-related variables that determined efficiency levels of Bulgarian banks over the sample period. Profitability, liquidity, and capitalization were shown to have a positive effect on efficiency. A larger market share and foreign ownership were also associated with higher efficiency levels. Enterprise restructuring boosted bank efficiency as it improved the governance and creditworthiness of corporate customers. Bank reforms, on the other hand, were inversely related to technical efficiency and had no significant effect on cost and allocative efficiency. As previous studies on transition economies have shown, the tightening of prudential requirements imposes costs on financial intermediation and may adversely affect efficiency; however, more research is needed to reveal the reform components responsible for efficiency losses. Our findings also indicate that the accession to, and the membership, in the EU might have contributed to marked improvements in bank performance. The signing of the Treaty of Accession in 2005 coincided with the largest gains in technical efficiency over the sample period, whereas the first year of

EU membership was associated with advances in cost and allocative efficiency, although more research is needed to confirm these findings over longer periods of EU membership.

The successful privatization of state-owned banks, the dominance of well-managed foreign banks, the improving efficiency of the banking sector, and the benefits of EU accession revealed in this paper reflect the transition of Bulgaria from a slow reformer to a thriving emerging economy over the past decade.

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# Structural Current Account Imbalances: Fixed Versus Flexible Exchange Rates?

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**Abstract.** This paper returns to the age-old question of fixed versus flexible exchange rate. Using a panel of 128 countries over the period 1976-2005, I find that the structural current account balances of countries with fixed exchange rates are more highly correlated with fundamental drivers (such as net foreign assets, incomes, growth rates, fiscal policy, demographics, resource endowments) than the current accounts of floaters. Furthermore, this greater sensitivity to fundamentals leads to larger current account imbalances (both deficits and surpluses) for peggers. Pegging the exchange rate is statistically associated with a 1.1 per cent increase in a country's current account imbalance, relative to floating. These greater net flows of capital indicate that fixed exchange rates might facilitate international capital mobility and financial integration. Finally, there is typically no difference between peggers and floaters in terms of current account persistence and, hence, the speed of adjustment of the current account.

**Резюме.** Изследването се връща на стария въпрос, фиксиран или плаващ валутен курс. Използвайки панел от 128 държави в периода 1976–2005 г., стигнах до извода, че структурното салдо по текущата сметка на платежния баланс в държавите с фиксиран валутен курс по-силно корелира с основните движещи сили (като нетни чуждестранни активи, доходи, темпове на растеж, бюджетна политика, демография, ресурсообезпеченост), отколкото в тези с плаващ валутен курс. Нещо повече, тази по-голяма чувствителност на основните показатели води в държавите с фиксиран курс до по-големи дисбаланси по текущата сметка (както дефицити, така и излишъци). Фиксирането на валутния курс статистически е свързано с 1.1% увеличение на дисбаланса по текущата сметка в сравнение с държавите с плаващ курс.Тези по-големи нетни капиталови потоци показват, че фиксираният валутен курс може да улесни международната мобилност на капитала и финансовата интеграция. Накрая, обикновено няма разлика между държавите с фиксиран и тези с плаващ валутен курс по отношение на устойчивостта на текущата сметка на платежните им баланси и следователно по отношение на скоростта на нейното приспособяване.

## Contents

## 1. Introduction

In the past several years, we have seen large current account imbalances in many countries around the world. High-income countries like the United States, United Kingdom, and Spain have run large current account deficits. Many of the new EU member states from Central and Eastern Europe currently have current account deficits in the double digits. On the other hand, East Asian emerging economies, major oil exporters, and some industrialized countries (Germany, Japan) have registered large current account surpluses. Figure 1 illustrates the increase in current account imbalances for 128 countries around the world (see the Appendix for the country list). The figure reports the evolution over time of the mean *absolute* value of current account balances (expressed as a percentage of GDP). It also reports the cross-section standard deviation of current account balances. Both measures of global current account imbalances increased steadily in the past twenty years.

Current account imbalances measure the net flow of capital among countries. Countries with current account surpluses (deficits) are in effect lending to (borrowing from) the rest of the world. Thus, it is plausible that large and increasing current account imbalances reflect greater capital mobility and global financial integration. This paper will explore the impact of exchange rate regimes on current account imbalances in the medium term (after filtering out the business cycle). The main contribution of the paper is in Sections 2 and 3 which examine a broad panel of 128 countries over the period between 1976 and 2005. These sections estimate an empirical model of medium-term current account dynamics similar to the one developed in Chinn and Prasad (2003) and in Chinn and Ito (2007). These papers show that in the medium term, a country's current account depends on its stock of net foreign assets, relative income, relative GDP growth rate, budget balance, and its relative demographic profile. By extending the Chinn – Prasad – Ito model, I find that the structural current account balances of countries with fixed exchange rates around the world are more sensitive to most of these fundamental factors than the current account balances of floaters. Furthermore, this greater sensitivity to fundamentals leads to larger current account imbalances (both larger deficits and larger surpluses). Fixing the exchange rate is statistically associated with a 1.1 per cent increase in a country's current account imbalance, relative to floating. These greater net flows of capital indicate that fixed exchange rates might facilitate international capital mobility and financial integration. One could hypothesize that by unlocking countries' current account constraints fixed exchange rates facilitate the optimal allocation of consumption and investment over time and the efficient allocation of capital around the world. Finally, there is typically no difference between peggers and float-

ers in terms of current account persistence and, hence, the speed of adjustment of the current account. Section 4 offers several robustness checks, while Section 5 reports the results from a counterfactual simulation, which sheds further light on the main results. Section 6 concludes.

## 2. The Empirical Model and the Data

### *2.1. Model Setup*

Chinn and Prasad (2003) and Chinn and Ito (2007) offer a model of the determinants of current account balances in the medium term (after filtering out the economic cycle). Both of these papers are purely empirical. However, they are informed by theory, that is, by the intertemporal approach to the current account, which is an extension of the lifecycle theory of consumption and saving to the open economy. These papers estimate regression equations similar to this one:

$$Current\_account_{i,t} = \beta_0 + \beta_1 NFA_{i,t-1} + \beta_2 Relative\_income_{i,t} + \\ + \beta_3 Relative\_growth_{i,t} + \beta_4 Budget_{i,t} + \beta_5 Old\_dep\_ratio_{i,t} + \varepsilon_{i,t} \quad (1)$$

$Current\_account_{i,t}$ denotes the current account balance, as a percentage of GDP, of country *i* in period *t*. $NFA_{i,t-1}$ denotes the net foreign assets (as a percentage of GDP) of country *i* in period *t-1*. Empirical estimates of $\beta_1$ are typically positive. Since net foreign assets are computed by cumulating past current account balances, $\beta_1$ measures the persistence of a country's current account over time.[1] In other words, $\beta_1$ captures inertia, the degree to which the current account is driven by its own history. One might interpret $\beta_1$ as being inversely related to the speed of adjustment of the current account. The conventional wisdom among economists is that the current accounts of countries with fixed exchange rates are more persistent than those of floaters ( $\beta_1^{Fix} > \beta_1^{Float} > 0$ ), and therefore the current accounts of peggers are more rigid and their speed of adjustment is lower.

$Relative\_income_{i,t}$ is country i's per-capita GDP (adjusted for PPP) relative to the cross-section average in period *t*. In theory, capital should flow from high-income to low-income countries. Low-income countries tend to save less and invest more. This gives rise to current account deficits. The opposite is true of high-income countries. Therefore, I expect to find $\beta_2 > 0$.

[1]Including the current value of NFA would have been problematic since it would introduce a clearly endogenous variable on the right-hand side of equation (1).

*Relative_growth*$_{i,t}$ denotes country i's GDP growth rate relative to the sample average in period t. Under the intertemporal approach to the current account, the GDP growth rate proxies for the marginal product of capital in a given country. One may also think of the GDP growth rate as a proxy for expectations of future income. Under either interpretation we expect to find $\beta_3 < 0$. That is, capital should flow from slow-growing to fast-growing countries. Fast-growing countries will be running deficits, while slow-growing ones will be running surpluses ($\beta_3 < 0$). It is important to note that what matters is a country's GDP growth rate *relative* to the cross-section average in a given period. Because the current accounts of all countries around the world must add up to zero in any given year, it is impossible for all countries to be running current account deficits at the same time, no matter how fast they are growing. The *relatively* faster-growing countries will be running deficits, while the *relatively* slower-growing ones will be running surpluses.

*Budget*$_{i,t}$ denotes a country's budget balance, as a percentage of its GDP. Empirical estimates of $\beta_4$ are typically positive but smaller than unity. An increase of one dollar in the budget deficit typically leads to a smaller increase in a country's current account deficit. This could be due to two reasons. First, changes in public savings might induce changes in private saving behavior, via the 'Ricardian equivalence' channel. If the government decides to save less, the private sector might decide to save more in response, and therefore the reduction in national savings might be less than one dollar. Second, an increase in the budget deficit might push up the equilibrium real interest rate and crowd out domestic investment. Of course, this mechanism is at work only for countries which are large enough to be able to influence the equilibrium world real interest rate, or for countries which are imperfectly integrated into international financial markets.

Finally, *Old_dep_ratio*$_{i,t}$ denotes the share of people in country *i* aged 65 or above, relative to the cross-section average for period *t*. According to standard lifecycle theory, the higher the old-age dependency ratio, the lower a country's national saving rate and its current account balance. Therefore, $\beta_5$ is expected to turn out negative. Once again, it is important to note that what matters is a country's demographic profile *relative* to the cross-section average in a given period. Even if all countries in the sample have ageing populations, they cannot all run current account deficits simultaneously. The *relatively* older countries will be running deficits, while the *relatively* younger ones will be running surpluses.

The main hypothesis this paper wants to test is that the exchange rate regime affects the regression coefficients in equation (1), both the intercept $\beta_0$ and (more importantly) the slope parameters $\beta_1$-$\beta_5$. In particular, this paper will test the hypothesis that fixed exchange rate regimes are more conducive

to financial integration and capital mobility. If indeed fixing the exchange rate unlocks a country's current account, then we would expect the current accounts of peggers to be more tightly linked to the fundamental drivers listed above. For example, we expect to find that ( $\beta_1^{Fix} > \beta_1^{Float} > 0$ ). In other words, current account balances are positively correlated with per-capita incomes for floaters, and even more positively correlated for fixers. A country with a fixed exchange rate should have a tighter positive relationship between its current account and its relative income. The same logic should apply to all other variables. Therefore, we expect to find:

$$\beta_3^{Fix} < \beta_3^{Float} < 0$$
$$\beta_4^{Fix} > \beta_4^{Float} > 0$$
$$\beta_5^{Fix} < \beta_5^{Float} < 0$$

There are three ways to use equation (1) in order to test the above hypotheses about the impact of exchange rate regimes on current account dynamics. First, the equation could be augmented with a variable $ERR_{i,t}$ which describes the exchange rate regime of country *i* during period *t*, with *ERR = 1* for a fixed exchange rate, *ERR = 2* for an intermediate regime, and *ERR = 3* for a floating exchange rate regime. $ERR_{i,t}$ would enter equation (1) both by itself and in interaction with all the righthand-side variables, in order to see how the exchange rate regime affects the intercept and the slope parameters. The main shortcoming of this approach is that it imposes a linear, monotonic relationship between exchange rate regimes and current account balances. This is a strong assumption, which is not justified by theory. Therefore, this approach is not pursued further.

Second, equation (1) could be estimated separately for peggers, floaters, and countries with intermediate exchange rate regimes. Instead of estimating equation (1) for the full sample, I will estimate it for 3 different non-overlapping sub-samples. This approach is less restrictive, but has the downside of offering less power and precision, due to the smaller sample sizes. In addition, with 3 different regression equations, it is not straight-forward to establish if the differences in regression coefficients across exchange rate regimes are statistically significant.

Third, equation (1) could be augmented with 2 dummy variables: $Floating_{i,t}$ and $Intermediate_{i,t}$. $Floating_{i,t}$ is set to 1 for each country during each period in which it maintains a flexible exchange rate. $Intermediate_{i,t}$ is defined similarly. (Obviously, countries with fixed exchange rates serve as a benchmark against which the other two groups are compared.) Both dummy variables will enter the augmented regression equation both by themselves and in interaction with the 5 righthand-side variables (so I will have a total of 10 interaction terms). This approach should yield exactly the same coefficient estimates as

the second one, but different standard errors. The main advantage of this approach is that it allows to test directly if the differences among exchange rate regimes are statistically significant. On the other hand, this approach imposes the restriction that the error term is distributed identically across exchange rate regimes. This paper will focus on the second and third approaches.

### *2.2. Preliminary Data Analysis*

Equation (1) will be estimated using a panel of 128 countries over the period between 1976 amd 2005. The list of participating countries is given in the Appendix. This includes all 30 members of the Organization for Economic Cooperation and Development (OECD) and all 27 members of the European Union (the two groups overlap, of course). 128 countries turned out to be the maximum possible number of countries that could have been included. They come in all sizes, from all continents, and at all levels of development.

In constructing a panel dataset, there is always the difficult trade-off between maximizing the number of degrees of freedom and preserving the homogeneity of the data. One might argue that 128 countries amount to a rather heterogeneous panel. The results from this paper might be interpreted as describing the hypothetical 'average country.' Furthermore, in Section 4 I focus on more homogenous sub-samples of countries – by estimating equation (1) for high-income and low-income countries separately, and also for the 1976 to1990 period versus that between 1991 and 2005 separately.

The time frequency of the underlying data is annual. However, in estimating equation (1) I use non-overlapping 5-year arithmetic means of the corresponding annual variables.[2] There are two exceptions. $Relative\_growth_{i,t}$ refers to the 5-year *geometric* mean of the corresponding annual variables. $NFA_{i,t-1}$ refers to net foreign assets in the year preceding the beginning of the current 5-year period. For example, if the current period is from 2001 fill 2005, then $NFA_{i,t-1}$ refers to net foreign assets in 2000. Five-year averages are used in order to filter out short-term business cycle fluctuations in the data, so that we can focus on the medium term.

The data source for most of the variables is the World Bank's database World Development Indicators (WDI). For $Budget_{i,t}$ data from the WDI were supplemented by data from the International Monetary Fund's database International Financial Statistics. For $NFA_{i,t}$, I used the data compiled in Milesi-Ferretti and Lane (2007). Finally, for exchange rate regimes, I used the data

[2]Due to missing data for some periods and countries, some of the averages are based on fewer than 5 data points.

compiled in Levy-Yeyati and Sturzenegger (2005).[3] They classify countries around the world into 4 groups: with fixed, intermediate, floating, and inconclusive exchange rate regimes. Since I am working with non-overlapping 5-year periods, the $ERR_{i,t}$ variable is set to 1, 2, or 3 (fixed, intermediate, or floating, respectively) only if country i maintained the same exchange rate regime for 4 out of the 5 years in the period.

The total sample size is 525 data points covering 128 countries, or 68 per cent of the theoretical maximum of 768 data points (128 countries * 6 non-overlapping 5-year periods between 1976 and 2005). However, when I restrict the sample to only the data points for which $ERR_{i,t}$ = 1,2,3, the sample size falls to 284 data points covering 104 countries, or 37 per cent of the theoretical maximum.[4] The data constitute an unbalanced panel. Equation (1) is estimated by OLS with time-fixed effects. Following Chinn and Prasad (2003), Chinn and Ito (2007), and Gruber and Kamin (2007), I do not include country-specific fixed effects. Those papers argue that allowing for country-specific intercepts would lead to a distraction from understanding the cross-country variation in current account balances. The country fixed effects soak up most of the cross-country variation in the data. As a result, the remaining coefficient estimates reflect the 'within' (time-series) variation in the panel. If we want to explore the impact of exchange rate regimes on current account balances, then it is imperative that we capture the true sources of 'between' (cross-section) variation in the data.[5]

The correlation matrix for the variables in the dataset is reported in Table 1. $Financial\_openness_{i,t}$ is the measure of international capital mobility developed by Chinn and Ito.[6] It is based on *de jure* restrictions on capital mobility which are reported to the International Monetary Fund by member countries and are compiled by the IMF in its Annual Report on Exchange Arrangements and Exchange Restrictions. $Trade\_openness_{i,t}$ stands for exports plus imports as a percentage of a country's GDP. $Financial\_depth_{i,t}$ denotes the ratio of a country's stock of M3 to its GDP, and serves as a proxy for domestic financial development. $Size_{i,t}$ is the natural log of country i's share in world GDP during

[3]Another alternative – using the database compiled in Reinhart and Rogoff (2004) – is left as a possible future extension of this paper.

[4]I lose 241 data points due to the conservative definition of $ERR_{i,t}$.

[5]The argument here echoes the ones forcefully made in Quah (1995), Wacziarg (2002), and Lane (2004).

[6]The Chinn-Ito measure of financial openness is available on the authors' websites at http://www.ssc.wisc.edu/~mchinn/research.html or http://web.pdx.edu/~ito/.

period t, measured in constant (year 2000) US dollars. This variable enters in natural logs in order to reduce the influence of outliers (such as the United States and Japan). $Inflation_{i,t}$ is the natural log of a country's gross rate of inflation, as measured by either the CPI or the GDP deflator. It enters in natural logs in order to reduce the influence of (hyper-inflationary) outliers. $Inflation_{i,t}$ refers to the 5-year *geometric* mean of annual inflation rates.

The five panels of Table 2 report simple descriptive statistics for the variables in the dataset. Panel A describes the full sample. Panel B restricts the sample to only the countries and periods for which we have data on the exchange rate regime in place ($ERR_{i,t} = 1,2,3$). By comparing Panels A and B, we can see that they look quite similar to each other. The sub-sample described in Panel B appears to be somewhat richer, younger, and more financially open. Average inflation is also somewhat lower. But the differences are small, and the restricted sample does not look too different from the full one. Panel C, D, and E report descriptive statistics for countries with fixed, intermediate, and floating exchange rate regimes, respectively. Throughout this paper, the discussion will focus on the contrast between peggers and floaters. First, the sub-sample with intermediate exchange rate regimes is quite small (31 data points). Second, intermediate exchange rate regimes have all but been written off in recent years by academics and policymakers as too crisis-prone. This is the so-called 'bipolar view' discussed in Fischer (2001). On the other hand, the debate about fixed versus flexible exchange rates is as topical as ever.

By comparing Panels C and E, we can identify multiple ways in which the two groups are systematically different from each other. Fixers tend to have larger current account deficits on average, as well as larger current account imbalances (either deficits or surpluses). Unsurprisingly, they have larger stocks of net foreign debt (more negative net foreign assets). Floaters tend to be richer. However, there seems to be no difference in average GDP growth rates or budget balances between peggers and floaters. Floaters appear to have higher old-age dependency ratios. Their financial openness tends to be higher, while their trade openness (defined as exports plus imports as a share of GDP) is lower. Peggers have lower domestic financial depth (defined as the ratio of M3 to GDP). They also tend to be smaller (*Size* is the natural log of a country's share in world GDP). Finally, peggers enjoy lower and less variable inflation rates, which is unsurprising.

## *3. Results*

Column (1) of Table 3 reports results from estimating equation (1) for the full sample, as a benchmark.[7] The fit of the model is good, with an $R^2$ of 0.37. All regression coefficients have the expected signs, and all except *Relative_growth* are statistically significant at the 1 per cent level. Current account balances are persistent, as shown by the coefficient on the *NFA* variable. Countries with relatively high per-capita incomes and budget surpluses tend to have current account surpluses. Countries with relatively high old-age dependency ratios tend to have current account deficits. The insignificance of *Relative_growth* is unsurprising, given the recent literature on 'perverse/upstream/uphill capital flows' – see Gourinchas and Jeanne (2007) or Prasad, Rajan, and Subramanian (2007). Overall, the results reported here are quite similar to those in Chinn and Prasad (2003) and Chinn and Ito (2007). While we have not established anything about exchange rate regimes yet, it is good to know that the model explains structural current account balances quite well.

Column (2) looks at the restricted sample which includes only the countries and periods for which we have data on the exchange rate regime in place ($ERR_{i,t} = 1,2,3$). The results reported in column (2) are nearly identical to those in column (1). Once again, the restricted sample appears to be rather similar to the full one, even though the number of data points falls from 525 to 284, while the number of countries covered falls from 128 to 104.

Columns (3) through (5) estimate equation (1) separately for peggers, countries with intermediate exchange rate regimes, and floaters. For the reasons discussed above the discussion will focus on the contrast between fixed and flexible exchange rate regimes, that is, on columns (3) and (5). The current accounts of both peggers and floaters are persistent. However, the difference between $\beta_1^{Fix}$ and $\beta_1^{Float}$ appears to be too small to be statistically significant. In other words, there does not appear to be a difference between countries with fixed and flexible exchange rate regimes, as far as the speed of current account adjustment is concerned.

Compared to floaters, peggers have current account balances which are more positively correlated with relative incomes and budget balances, and more negatively correlated with old-age dependency ratios. For countries with fixed exchange rates, the coefficient estimates on net foreign assets, relative incomes, budget balances, and dependency ratios are statistically significant at the 5 per cent level, or better. For countries with floating exchange rates, only the coefficient estimate on NFA is statistically significant. The insig-

[7] All regressions reported in this paper were estimated using Stata.

nificance of all the other coefficients suggests that the current accounts of countries with flexible exchange rate are decoupled from fundamental factors (other than history/inertia). As hypothesized earlier, a fixed exchange rate regime increases the correlation of current account balances with most of their fundamental drivers. The intertemporal approach to the current account seems to apply better to countries with fixed exchange rates. This is the main result of this paper.

How do fixed exchange rate regimes accomplish this? One might hypothesize that fixed exchange rates boost macroeconomic credibility by limiting the independence of national currencies and the ability to run a discretionary monetary policy. They might facilitate the development of deeper and more liquid domestic financial markets. For these reasons, fixed exchange rates might be more conducive to financial integration and international capital mobility. That is why they might lead to a tighter link between current accounts and fundamental drivers. The only two flies in the ointment are the coefficients on *Relative_growth*, which are statistically insignificant and have the wrong signs, for both fixers and peggers.[8]

The comparison between columns (3) and (5) of Table 3 is indicative. However, we still do not know if the differences between peggers and floaters are statistically significant. Column (1) of Table 4 helps resolve that issue. Table 4 estimates an augmented version of equation (1):

$$\begin{aligned}\text{Current\_account}_{i,t} = {} & \beta_0 + \beta_1 \text{Floating}_{i,t} + \\ & + \beta_2 \text{NFA}_{i,t-1} + \beta_3(\text{NFA}_{i,t-1} * \text{floating}_{i,t}) + \\ & + \beta_4 \text{Relative\_income}_{i,t} + \beta_5(\text{relative\_income}_{i,t} * \text{floating}_{i,t}) + \\ & + \beta_6 \text{Relative\_growth}_{i,t} + \beta_7(\text{relative\_growth}_{i,t} * \text{floating}_{i,t}) + \\ & + \beta_8 \text{Budget}_{i,t} + \beta_9(\text{budget}_{i,t} * \text{floating}_{i,t}) + \\ & + \beta_{10} \text{Old\_dep\_ratio}_{i,t} + \beta_{11}(\text{old\_dep\_ratio}_{i,t} * \text{floating}_{i,t}) + \\ & + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Equation (1) is augmented with the *Floating* dummy variable.[9] It enters the augmented regression equation both by itself and in interaction with the 5 right-hand variables (so there is a total of 5 interaction terms). Countries with

[8] As one can see from column (4), the negative sign on Relative_growth in the full samples in columns (1) and (2) is driven by countries with intermediate exchange rate regimes.

[9] Since the number of data points corresponding to countries and periods with intermediate exchange rate regimes is rather small, from now on those 29 observations will be excluded from the sample. The remainder of this paper will focus on the differences between peggers and floaters.

fixed exchange rates serve as a benchmark against which we compare floaters. Note that the estimate of the interaction between Floating and NFA is statistically insignificant. There is no evidence that the current accounts of countries with fixed exchange rates are significantly more persistent than those of floaters. This is important because it means that the speed of current account adjustment does not differ across the two types of exchange rate regimes. This goes against conventional wisdom which holds that the current accounts of peggers are more rigid and this constitutes a serious shortcoming of fixed exchange rate regimes.[10] The insignificance of (NFA * Floating) means that there is no evidence that flexible exchange rates are superior to fixed ones in facilitating current account adjustment.

The current accounts of floaters are less sensitive to relative incomes and budget balances than those of peggers, and the differences are statistically significant at the 10 per cent and 12 per cent levels, respectively. The current accounts of countries with flexible exchange rates are less connected to demographic structure, but that difference is not significant.

## 4. Four Robustness Checks

### *4.1. High-income versus Low-income Countries*

Given the potential criticism that the full sample of 128 countries is rather heterogeneous, columns (2) and (3) of Table 4 report results from re-estimating equation (2) separately for high-income and for low-income countries. Column (2) limits the sample to the richest 49 countries. Column (3) limits the sample to the poorest 50 countries. By doing this, I want to investigate if the impact of exchange rate regimes on current account balances is different at different levels of economic development.

For high-income countries, the results are clean and strong. Among these countries, peggers have current account balances which are (significantly) positively correlated with relative incomes and with budget balances. For floaters, both of these correlations are not statistically different from zero. The difference between peggers and floaters is statistically significant in both cases. Among high-income countries, peggers have current account balances which are (significantly) negatively correlated with old-age dependency ratios. For floaters, that correlation is again around zero. The difference between peggers and floaters is again statistically significant. Furthermore, peggers

[10]A very similar result is reported in Chinn and Wei (2008). They label the assertion that flexible exchange rate regimes facilitate current account adjustment a 'faith-based initiative.'

have current account balances which are (insignificantly) negatively correlated with growth rates. For floaters, that correlation is around zero. However, the difference between peggers and floaters is statistically insignificant. Finally, there is no evidence that the current accounts of peggers are any more or less persistent than those of floaters, among high-income countries.

For low-income countries, the results are weaker and less clear-cut. Among these countries, peggers have current account balances which are (significantly) positively correlated with relative incomes and with budget balances. For floaters, both of these correlations are not statistically different from zero. The difference between peggers and floaters is not statistically significant in both cases. There is strong evidence that the current accounts of floaters are less persistent than those of peggers, among low-income countries. It could be the case that current account adjustment poses more of a challenge for low-income countries with fixed exchange rate regimes than it does for high-income peggers.

### *4.2. 1976–1990 versus 1991–2005*

Another way to check the robustness of the main results is to compare and contrast 1976–1990 versus 1991–2005, in order to investigate if the impact of exchange rate regimes on current account balances has evolved over time. Columns (4) and (5) of Table 4 report results from re-estimating the equation (2) separately for the two periods. Column (4) limits the sample to 1976–1990. Column (5) limits the sample to 1991–2005. The regression results in columns (4)–(5) are broadly supportive of the main results, and there does not seem to be a sharp difference in the impact of exchange rate regimes on current account balances between the two periods. In both periods, there is no significant evidence that the current accounts of fixers are more persistent than those of floaters. In both periods, the current accounts of floaters are less correlated with relative incomes and with demographic structure (but the difference is statistically significant only in the early period for both variables). In both periods, the current accounts of floaters are less correlated with budget balances (but this time the difference is statistically significant only for 1991–2005).

### *4.3. Endogenizing the Treatment*

One possible criticism of the empirical strategy adopted with equations (1) and (2) is that it is too reduced-form. In particular, the regressions reported in those tables assume that exchange rate regimes are strictly exogenous. The 'treatment' of a particular exchange rate regime is assumed to be assigned at random to countries. In fact, the opposite might very well be the case – the choice of an exchange rate regime is endogenous. Countries self-select into

receiving the treatment. In other words, there might be omitted variables which affect the decision to have a floating exchange rate. A possible solution to this problem is to develop a 'treatment effects' model, as follows. An unobserved latent variable determines the binary decision whether to obtain the treatment or not (have a floating exchange rate or not):

$$Z_{i,t} = \begin{cases} 1, & if \quad Z^*_{i,t} > 0 \\ 0, & otherwise \end{cases}, \tag{3}$$

where $Z$ is the (now endogenous) dummy variable *Floating*. $Z^*$ is the unobserved latent variable and it is modeled as a linear function of covariates:

$$Z^*_{i,t} = \gamma_0 + \gamma_1 W_{i,t} + u_{i,t} \tag{4}$$

The endogenous binary treatment Z then enters the primary equation:

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t} + \beta_2 Z_{i,t} + \beta_3 \left( X_{i,t} Z_{i,t} \right) + \varepsilon_{i,t}, \tag{5}$$

which is identical to equation (2). Finally, the error terms of the treatment equation and the primary equation are correlated with each other:

$$\begin{bmatrix} u_{i,t} \\ \varepsilon_{i,t} \end{bmatrix} \sim N\left( \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \Sigma \right) \tag{6}$$

Three variables were included as covariates for the treatment equation (4): $Financial\_openness_{i,t}$, $Trade\_openness_{i,t}$, and $Size_{i,t}$. First, perhaps the choice between fixed and flexible exchange rates depends on the openness of the country's capital account – the more financially open a country, the less likely it is to float (and the more likely it is to peg). Second, perhaps countries that trade a lot with the rest of the world are less likely to have floating exchange rates (and more likely to peg). Third, it is possible that country size matters – larger countries are more likely to float (while smaller countries are more likely to peg).

Table 5 presents the results from estimating the treatment effects model presented in equations (3)–(6) using the maximum likelihood estimator.[11] A Wald test of independent equations strongly rejects the null hypothesis (at the 1 per cent level of significance) that the error terms of the treatment and pri-

[11] The maximum likelihood estimator for the treatment effects model was developed in Maddala (1983). The treatment effects model is a close relative of the Heckman selection model.

mary equations are uncorrelated. For the treatment equation, the coefficient signs on all three covariates turn out according to expectations. Two of the three are significant at the 5 per cent level, or better. Only *Trade_openness* is statistically insignificant.

The results from estimating the primary equation (5) are quite similar to the OLS estimates reported in column (1) of Table 4, which assumed the 'treatment' to be exogenous. First, note that the estimate of the interaction between *Floating* and *NFA* is statistically significant now. This supports the claim that the current accounts of countries with fixed exchange rates are significantly more persistent than those of floaters. This finding is important because it means that the speed of current account adjustment does indeed differ across the two types of exchange rate regimes. The results here support the conventional wisdom which holds that the current accounts of peggers are more rigid. However, note that in almost all other regressions this coefficient is statistically insignificant.

Furthermore, the current accounts of floaters are less sensitive to incomes and demographic factors than those of peggers, and the differences are statistically significant at the 5 per cent level, or better. The current accounts of countries with flexible exchange rates are less connected to budget balances, but that difference is not significant.

### *4.4. Omitted Variables*

Another possible criticism of the empirical strategy adopted with equation (2) is that there might exist omitted variables, other than the exchange rate regime, which affect the current account dynamics of a given country. In other words, perhaps the fact that a country's current account is more (or less) correlated with fundamentals has nothing to do with its exchange rate regime, but is driven by other factors (which might themselves be correlated with the exchange rate regime). Some plausible omitted variables are discussed below.

First, perhaps countries with more open capital accounts are more likely to peg their exchange rates and also to have current accounts which are more correlated with fundamentals. Second, perhaps countries that trade a lot with the rest of the world are more likely to have a fixed exchange rate regime and to have current accounts which are more correlated with fundamental drivers. Third, nations with deeper, more liquid, more developed domestic financial markets are more likely to have current accounts which are more correlated with fundamental factors. Fourth, it is possible that country size matters – smaller countries are more likely to give up their monetary sovereignty and also to have current accounts which are more correlated with fundamentals. Fifth, perhaps a current account which is more correlated with fundamentals

is the by-product of low inflation. Perhaps what really matters is the country's monetary policy framework. Perhaps international financial integration is facilitated by monetary credibility and transparency. As long as a country has a low inflation rate, it will have a current account which is more correlated with fundamentals. It does not matter how the low inflation rate is achieved: via a fixed exchange rate, inflation-targeting combined with a floating exchange rate, or some other monetary policy framework *cum* exchange rate regime. As long as a country achieves low inflation, this will boost the correlation of its current account with fundamental factors. By including the inflation rate, we are asking the question: do fixed exchange rate regimes matter above and beyond achieving a low inflation rate?

To take into account all these possibilities, equation (2) is augmented with five additional variables: $Financial\_openness_{i,t}$, $Trade\_openness_{i,t}$, $Size_{i,t}$, $Financial\_depth_{i,t}$, and $Inflation_{i,t}$. The five columns of Table 6 report results from estimating equation (2), which is further augmented with the 5 variables listed above. In the five columns of that table, the five extra variables are introduced one by one. In each column, one of those 5 extra variables enters the estimation both by itself and in interaction with the 5 fundamental drivers of the current account, as shown in equation (1) in order to see how they affect the intercept and the slope terms. More importantly, I am interested in whether these five extra variables would knock out the interactions between the fundamental drivers and the *Floating* dummy. After including these five variables, I am able to conduct the following thought experiment: take two countries which are identical in every other respect (same degree of financial and trade openness, same degree of domestic financial development, same economic size and rate of inflation). Will the country with a fixed exchange rate still have a current account which is more correlated with fundamentals compared to the country with a floating exchange rate? Table 6 reports the results, and the answer is broadly in the affirmative.

In all 5 columns, the regression coefficients on net foreign assets, relative incomes, budget balances, and old-age dependency ratios almost always retain the correct signs, and they are almost always statistically significant. The current accounts of floaters are less correlated with relative incomes in all 5 columns of Table 6, and the difference between peggers and floaters is always statistically significant. Furthermore, the current accounts of floaters are less correlated with budget balances and with demographic factors in all 5 columns of Table 6. However, the difference between peggers and floaters is statistically significant in 2 or 3 out of 5 cases. We may conclude that countries with fixed exchange rates have current accounts which do tend to be more tightly correlated with fundamental drivers than countries with floating exchange rates. This is the case even after allowing for a diverse set of potential

omitted variables. Finally, except for column (2), there is no evidence that the current accounts of peggers are more persistent than those of floaters.

Regarding the five omitted variables, the interaction terms with the fundamental drivers are almost never statistically significant. We find statistical evidence that trade openness reduces the persistence of current account balances and increases their sensitivity to relative incomes. Larger economies have current accounts which are less persistent. But the vast majority of coefficients on the interaction terms between the 5 omitted variables and the 5 fundamental drivers (22 out of 25) are statistically insignificant.[12]

## 5. Counterfactual Simulation Exercise

Table 7 reports the results from a counterfactual simulation, which sheds further light on the main results. The table focuses only on those countries and periods for which *ERR = 1*, that is, the peggers in the sample. The table has 189 rows, involving 77 different countries. The fourth column of the table reports fitted values for current account balances which are based on the coefficient estimates in column (3) of Table 3. The difference between the third and fourth column tells us how well the model matches the data. The fifth column of Table 7 computes fitted values for current account balances under the counterfactual assumption that *ERR = 3* (while, in reality, *ERR = 1*). Those counterfactual values are based on the coefficient estimates reported in Column (5) of Table 3. In other words, I compute the current account balance for a hypothetical country with the same level of net foreign assets, income, GDP growth rate, budget balance, and demographic structure. The only difference is the exchange rate regime: it is flexible rather than fixed. One may interpret the difference between the fourth and fifth column as a measure of the impact of floating the exchange rate on the current account balance of the particular pegging country.

The *unshaded* rows in the table correspond to those countries and periods for which the ratio of the fourth to the fifth column is *greater* than unity. Intuitively, these are all the cases in which a fixed exchange rate regime is associated with a larger current account imbalance (either a larger deficit or a larger surplus), compared to the counterfactual under which the exchange rate is floating. It turns out that this is the case for 139 out of the 189 data points in the table (or 74 per cent). The typical story is one of a larger current account deficit under fixed exchange rates, although there are several cases of larger current account surpluses as well.

[12]Results from a regression including all 5 omitted variables simultaneously and the associated large set of interaction terms are available from the author upon request. They are consistent with the results reported here, and are omitted in order to conserve space.

For example, for Bulgaria over the 2001 to 2005 period, the model predicts a current account deficit of 5.1 per cent of GDP (while the actual deficit was 6.1 per cent). With a floating exchange rate, the model predicts that a country with features identical to Bulgaria's would have run a current account deficit of only 2.7 per cent. Thus, Bulgaria's currency board is statistically associated with an increase in the current account deficit of 2.3 percent of GDP between 2001 and 2005.

For Belgium over the 2001 to 2005 period, the model predicts a current account surplus of 2.3 per cent of GDP. The model further predicts that a floater with a profile identical to Belgium's one would have run a surplus of only 0.4 per cent over that same period. For Luxembourg over the 2001 to 2005 period, the model predicts a current account balance of +12.4 per cent of GDP. With a flexible exchange rate, the model predicts that a country with features identical to those of Luxembourg would have run a current account balance of only +3.6 per cent.

Finally, the sixth column of Table 7 reports the increase in the current account imbalance (either a larger deficit or a larger surplus) under 'Fitted' relative to 'Counterfactual.' An increase in the imbalance is reported with a positive sign, while a decrease in the imbalance or a switch in sign is reported with a negative sign. It turns out that a fixed exchange rate regime is associated with a 1.1 per cent increase in a country's current account imbalance, on average, relative to a floating exchange rate regime. In conclusion, a fixed exchange rate not only links a country's current account more tightly to fundamental drivers, but it is also associated with greater current account imbalances.

## 6. Concluding Remarks

This paper explored a particular dimension of the age-old question of fixed versus flexible exchange rates. Using a panel of 128 countries over the 1976 to 2005 period, I find that the structural current account balances of fixers are more highly correlated with fundamental drivers than the current accounts of floaters. These results survive several robustness checks: they hold in various sub-samples, after allowing for a diverse set of potential omitted variables, and after allowing for the possibility that the treatment itself is endogenous. Furthermore, this greater sensitivity to fundamentals leads to larger current account imbalances (both deficits and surpluses) for peggers relative to floaters. Pegging the exchange rate is statistically associated with a 1.1 per cent increase in a country's current account imbalance, relative to floating. There is typically no difference between peggers and floaters in terms of current account persistence and, hence, the flexibility of the current account. In other words, there is no evidence that floating exchange rates are superior to fixed ones in speeding up current account adjustment.

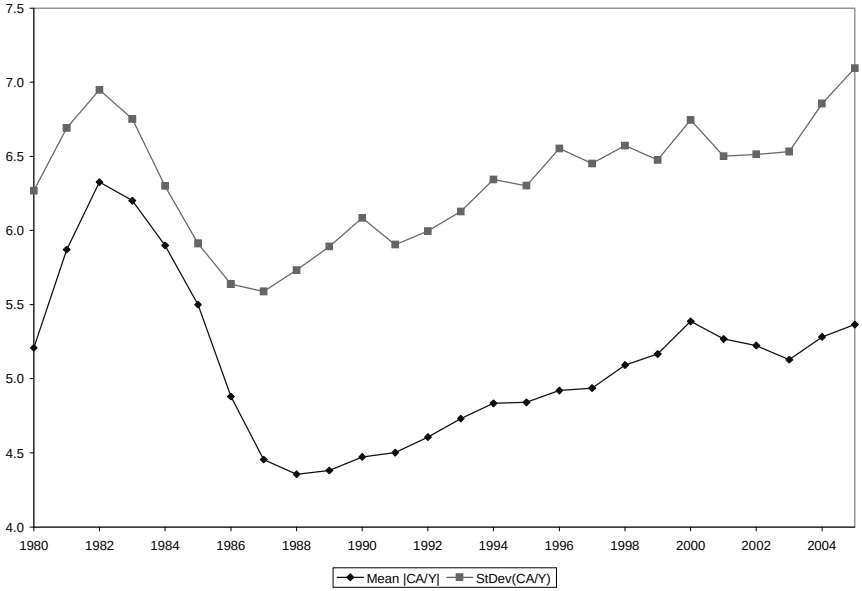
# APPENDIX

## LIST OF THE 128 COUNTRIES COVERED IN THE DATASET

1. Albania
2. Algeria
3. Argentina
4. Armenia
5. Australia
6. Austria
7. Azerbaijan
8. Bahrain
9. Bangladesh
10. Belarus
11. Belgium
12. Benin
13. Bolivia
14.Botswana
15. Brazil
16. Bulgaria
17. Burkina Faso
18. Cambodia
19. Cameroon
20. Canada
21. Chad
22. Chile
23. China
24. Colombia
25. Republic of Congo
26. Costa Rica
27. C?te d'Ivoire
28. Croatia
29. Cyprus
30. Czech Republic
31. Denmark
32. Dominican Republic
33. Ecuador
34. Egypt
35. El Salvador
36. Estonia
37. Ethiopia
38. Fiji
39. Finland
40. France
41. Gabon
42. Georgia
43. Germany
44. Ghana
45. Greece
46. Guatemala
47. Guinea
48. Haiti
49. Honduras
50. Hungary
51. Iceland
52. India
53. Indonesia
54. Iran
55. Ireland
56. Israel
57. Italy
58. Jamaica
59. Japan
60. Jordan
61. Kazakhstan
62. Kenya
63. Korea
64. Kyrgyzstan
65. Latvia
66. Lebanon
67. Lithuania
68. Luxembourg
69. Macedonia
70. Madagascar
71. Malawi
72. Malaysia
73. Mali
74. Malta
75. Mauritius
76. Mexico
77. Moldova
78. Morocco
79. Namibia
80. Nepal
81. Netherlands
82. New Zealand
83. Nicaragua
84. Niger
85. Nigeria
86. Norway
87. Oman
88. Pakistan
89. Panama
90. Papua New Guinea
91. Paraguay
92. Peru
93. Philippines
94. Poland
95. Portugal
96. Romania
97. Russia
98. Rwanda
99. Saudi Arabia
100. Senegal
101. Singapore
102. Slovakia
103. Slovenia
104. South Africa
105. Spain
106. Sri Lanka
107. Sudan
108. Swaziland
109. Sweden
110. Switzerland
111. Syria
112. Tajikistan
113. Tanzania
114. Thailand
115. Togo
116. Trinidad and Tobago
117. Tunisia
118. Turkey
119. Uganda
120. Ukraine
121. United Kingdom
122. United States
123. Uruguay
124. Venezuela
125. Vietnam
126. Yemen
127. Zambia
128. Zimbabwe

Figure 1

**SUMMARY STATISTICS ON CURRENT ACCOUNT BALANCES FOR A CROSS SECTION OF 128 COUNTRIES (PERCENTAGE OF GDP, 5-YEAR ROLLING AVERAGES)**




**Note:** See the Appendix.
**Source:** The World Bank's World Development Indicators

Table 1

**CORRELATION MATRIX**

| | Current_ account | NFA | Relative_ income | Relative_ growth | Budget | Old_dep_ ratio | Financial_ openness | Trade_ openness | Financial_ depth | Size | Inflation |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Current_account | 1.000 | | | | | | | | | | |
| NFA | 0.445 | 1.000 | | | | | | | | | |
| Relative_income | 0.273 | 0.318 | 1.000 | | | | | | | | |
| Relative_growth | 0.024 | 0.020 | -0.081 | 1.000 | | | | | | | |
| Budget | 0.315 | 0.065 | 0.094 | 0.204 | 1.000 | | | | | | |
| Old_dep_ratio | 0.136 | 0.233 | 0.780 | -0.086 | 0.079 | 1.000 | | | | | |
| Financial_openness | 0.128 | 0.157 | 0.492 | -0.021 | 0.172 | 0.372 | 1.000 | | | | |
| Trade_openness | 0.087 | 0.077 | 0.074 | 0.148 | 0.140 | 0.083 | 0.178 | 1.000 | | | |
| Financial_depth | 0.221 | 0.264 | 0.452 | 0.071 | -0.062 | 0.346 | 0.256 | 0.275 | 1.000 | | |
| Size | 0.336 | 0.243 | 0.594 | -0.018 | -0.016 | 0.456 | 0.264 | -0.346 | 0.370 | 1.000 | |
| Inflation | -0.169 | -0.163 | -0.089 | -0.196 | -0.346 | -0.048 | -0.245 | -0.187 | -0.166 | 0.062 | 1.000 |

Table 2

**DESCRIPTIVE STATISTICS**

**A. Full dataset**

| Variable | Number of observations | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| *Current_account* | 670 | -0.026 | 0.056 | -0.297 | 0.208 |
| *\|Current_account\|* | 670 | 0.046 | 0.040 | 0.000 | 0.297 |
| *ERR = 1* | 369 | 0.710 | 0.454 | 0.000 | 1.000 |
| *ERR = 2* | 369 | 0.084 | 0.278 | 0.000 | 1.000 |
| *ERR = 3* | 369 | 0.206 | 0.405 | 0.000 | 1.000 |
| *NFA* | 657 | -0.388 | 0.573 | -6.546 | 1.568 |
| *Relative_income* | 694 | 1.003 | 0.986 | 0.057 | 5.074 |
| *Relative_growth* | 706 | 1.001 | 0.035 | 0.767 | 1.125 |
| *Budget* | 577 | -0.031 | 0.043 | -0.355 | 0.227 |
| *Old_dep_ratio* | 768 | 1.000 | 0.646 | 0.248 | 2.744 |
| *Financial_openness* | 658 | 0.088 | 1.488 | -1.767 | 2.603 |
| *Trade_openness* | 705 | 0.724 | 0.410 | 0.132 | 4.048 |
| *Financial_depth* | 633 | 0.464 | 0.334 | 0.010 | 2.322 |
| *Size* | 726 | -2.397 | 1.978 | -5.795 | 3.446 |
| *Inflation* | 703 | 0.172 | 0.344 | -0.057 | 3.180 |

**B. Restricted dataset (ERR = 1,2,3)**

| Variable | Number of observations | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| *Current_account* | 354 | -0.027 | 0.060 | -0.297 | 0.147 |
| *\|Current_account\|* | 354 | 0.050 | 0.043 | 0.000 | 0.297 |
| *ERR = 1* | 369 | 0.710 | 0.454 | 0.000 | 1.000 |
| *ERR = 2* | 369 | 0.084 | 0.278 | 0.000 | 1.000 |
| *ERR = 3* | 369 | 0.206 | 0.405 | 0.000 | 1.000 |
| *NFA* | 358 | -0.372 | 0.642 | -6.546 | 1.388 |
| *Relative_income* | 359 | 1.123 | 1.095 | 0.060 | 5.074 |
| *Relative_growth* | 360 | 1.003 | 0.028 | 0.910 | 1.125 |
| *Budget* | 299 | -0.029 | 0.044 | -0.269 | 0.227 |
| *Old_dep_ratio* | 369 | 0.959 | 0.672 | 0.248 | 2.437 |
| *Financial_openness* | 357 | 0.324 | 1.530 | -1.767 | 2.603 |
| *Trade_openness* | 363 | 0.725 | 0.424 | 0.140 | 2.709 |
| *Financial_depth* | 327 | 0.452 | 0.347 | 0.087 | 2.322 |
| *Size* | 364 | -2.341 | 2.201 | -5.758 | 3.446 |
| *Inflation* | 362 | 0.119 | 0.250 | -0.045 | 2.156 |

### C. Fixed exchange rate regime (ERR = 1)

| Variable | Number of observations | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| Current_account | 249 | -0.031 | 0.066 | -0.297 | 0.147 |
| \|Current_account\| | 249 | 0.057 | 0.045 | 0.000 | 0.297 |
| NFA | 252 | -0.425 | 0.717 | -6.546 | 1.388 |
| Relative_income | 253 | 0.985 | 1.056 | 0.070 | 5.074 |
| Relative_growth | 254 | 1.004 | 0.029 | 0.910 | 1.125 |
| Budget | 202 | -0.028 | 0.045 | -0.189 | 0.227 |
| Old_dep_ratio | 262 | 0.855 | 0.660 | 0.248 | 2.423 |
| Financial_openness | 252 | 0.271 | 1.502 | -1.767 | 2.603 |
| Trade_openness | 258 | 0.809 | 0.447 | 0.148 | 2.709 |
| Financial_depth | 229 | 0.388 | 0.268 | 0.087 | 2.132 |
| Size | 258 | -3.035 | 1.771 | -5.758 | 1.770 |
| Inflation | 256 | 0.076 | 0.086 | -0.045 | 0.989 |

### D. Intermediate exchange rate regime (ERR = 2)

| Variable | Number of observations | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| Current_account | 31 | -0.014 | 0.063 | -0.199 | 0.127 |
| \|Current_account\| | 31 | 0.047 | 0.044 | 0.003 | 0.199 |
| NFA | 30 | -0.178 | 0.547 | -1.105 | 1.089 |
| Relative_income | 31 | 1.209 | 1.076 | 0.099 | 3.638 |
| Relative_growth | 31 | 1.002 | 0.034 | 0.940 | 1.075 |
| Budget | 30 | -0.040 | 0.064 | -0.269 | 0.122 |
| Old_dep_ratio | 31 | 1.041 | 0.671 | 0.301 | 2.255 |
| Financial_openness | 29 | -0.161 | 1.371 | -1.767 | 2.603 |
| Trade_openness | 30 | 0.578 | 0.279 | 0.150 | 1.104 |
| Financial_depth | 29 | 0.573 | 0.442 | 0.128 | 1.621 |
| Size | 31 | -1.312 | 1.759 | -5.036 | 1.419 |
| Inflation | 31 | 0.445 | 0.700 | 0.002 | 2.156 |

### E. Flexible exchange rate regime (ERR = 3)

| Variable | Number of observations | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| *Current_account* | 74 | -0.020 | 0.028 | -0.119 | 0.037 |
| *\|Current_account\|* | 74 | 0.027 | 0.021 | 0.001 | 0.119 |
| *NFA* | 76 | -0.273 | 0.305 | -1.218 | 0.242 |
| *Relative_income* | 75 | 1.552 | 1.132 | 0.060 | 3.665 |
| *Relative_growth* | 75 | 1.001 | 0.021 | 0.942 | 1.074 |
| *Budget* | 67 | -0.027 | 0.028 | -0.112 | 0.022 |
| *Old_dep_ratio* | 76 | 1.282 | 0.610 | 0.373 | 2.437 |
| *Financial_openness* | 76 | 0.684 | 1.621 | -1.767 | 2.603 |
| *Trade_openness* | 75 | 0.498 | 0.263 | 0.140 | 1.344 |
| *Financial_depth* | 69 | 0.615 | 0.457 | 0.135 | 2.322 |
| *Size* | 75 | -0.378 | 2.363 | -5.381 | 3.446 |
| *Inflation* | 75 | 0.129 | 0.172 | -0.015 | 1.030 |

Table 3

**THE IMPACT OF EXCHANGE RATE REGIMES ON CURRENT ACCOUNT DYNAMICS – PART I**

**(PANEL REGRESSIONS, OLS WITH TIME-FIXED EFFECTS)**

| Dependent variable: Current_account<br>Sample<br>Independent variables | (1)<br>Full | (2)<br>Restricted<br>*(ERR=1,2,3)* | (3)<br>Fixed<br>*(ERR=1)* | (4)<br>Intermediate<br>*(ERR=2)* | (5)<br>Floating<br>*(ERR=3)* |
|---|---|---|---|---|---|
| **Constant** | **0.086** | **0.020** | **-0.034** | **0.419** | **-0.071** |
| | *(0.075)* | *(0.112)* | *(0.136)* | *(0.532)* | *(0.272)* |
| **NFA** | **0.039***** | **0.035***** | **0.034***** | **-0.018** | **0.027**** |
| | *(0.007)* | *(0.008)* | *(0.010)* | *(0.058)* | *(0.013)* |
| **Relative_income** | **0.018***** | **0.020***** | **0.026***** | **0.077*** | **0.005** |
| | *(0.005)* | *(0.006)* | *(0.008)* | *(0.042)* | *(0.007)* |
| **Relative_growth** | **-0.073** | **-0.028** | **0.021** | **-0.423** | **0.060** |
| | *(0.074)* | *(0.112)* | *(0.136)* | *(0.539)* | *(0.278)* |
| **Budget** | **0.319***** | **0.299***** | **0.338***** | **0.326** | **0.136** |
| | *(0.065)* | *(0.084)* | *(0.111)* | *(0.231)* | *(0.129)* |
| **Old_dep_ratio** | **-0.019***** | **-0.019**** | **-0.025**** | **-0.076*** | **-0.006** |
| | *(0.007)* | *(0.008)* | *(0.011)* | *(0.038)* | *(0.011)* |
| **Number of observations** | **525** | **284** | **189** | **29** | **66** |
| **Number of countries** | **128** | **104** | **77** | **21** | **34** |
| **$R^2$** | **0.37** | **0.37** | **0.39** | **0.60** | **0.23** |

**Note:** Columns (1)–(5) estimate equation (1) in the main text of the paper. Column (2) limits the sample to only the countries and periods for which there are data about their exchange rate regime (ERR = 1,2,3). Column (3) limits the sample to only the countries and periods for which ERR = 1, that is, there was a fixed exchange rate regime in place. Column (4) limits the sample to only the countries and periods for which ERR = 2, that is, there was an intermediate exchange rate regime in place. Column (5) limits the sample to only the countries and periods for which ERR = 3, that is, there was a floating exchange rate regime in place. All regressions report standard errors which are heteroscedasticity-consistent, as well as robust to clustering. Standard errors are reported in parentheses. ***, **, * denote statistical significance at the 1 per cent, 5 per cent, 10 per cent level, respectively. All regressions include time-fixed effects (coefficients not reported).

Table 4

## THE IMPACT OF EXCHANGE RATE REGIMES ON CURRENT ACCOUNT DYNAMICS – PART II

### (PANEL REGRESSIONS, OLS WITH TIME-FIXED EFFECTS)

| Dependent variable: Current_account<br>Sample<br>Independent variables | (1)<br>Full | (2)<br>Rich | (3)<br>Poor | (4)<br>1976–1990 | (5)<br>1991–2005 |
|---|---|---|---|---|---|
| **Constant** | **-0.037** | **0.114** | **-0.159** | **-0.083** | **0.188** |
| | *(0.135)* | *(0.212)* | *(0.175)* | *(0.131)* | *(0.316)* |
| **Floating** | **-0.037** | **-0.107** | **0.223** | **-0.107** | **-0.138** |
| | *(0.283)* | *(0.291)* | *(0.413)* | *(0.338)* | *(0.409)* |
| **NFA** | **0.033***** | **0.019** | **0.039***** | **0.024** | **0.037***** |
| | *(0.010)* | *(0.019)* | *(0.010)* | *(0.018)* | *(0.011)* |
| **(NFA * floating)** | **-0.005** | **0.029** | **-0.037*** | **-0.006** | **-0.011** |
| | *(0.016)* | *(0.026)* | *(0.021)* | *(0.024)* | *(0.017)* |
| **Relative_income** | **0.026***** | **0.028***** | **0.056**** | **0.040***** | **0.019**** |
| | *(0.008)* | *(0.009)* | *(0.026)* | *(0.015)* | *(0.010)* |
| **(relative_income * floating)** | **-0.020*** | **-0.031***** | **-0.014** | **-0.042**** | **-0.013** |
| | *(0.010)* | *(0.011)* | *(0.063)* | *(0.018)* | *(0.012)* |
| **Relative_growth** | **0.024** | **-0.126** | **0.134** | **0.076** | **-0.185** |
| | *(0.134)* | *(0.208)* | *(0.167)* | *(0.132)* | *(0.314)* |
| **(relative_growth * floating)** | **0.035** | **0.124** | **-0.220** | **0.074** | **0.131** |
| | *(0.282)* | *(0.285)* | *(0.420)* | *(0.338)* | *(0.407)* |
| **Budget** | **0.342***** | **0.243***** | **0.492**** | **0.187**** | **0.675***** |
| | *(0.111)* | *(0.071)* | *(0.221)* | *(0.085)* | *(0.207)* |
| **(budget * floating)** | **-0.250** | **-0.272** | **-0.262** | **-0.358** | **-0.450*** |
| | *(0.152)* | *(0.164)* | *(0.275)* | *(0.246)* | *(0.250)* |
| **Old_dep_ratio** | **-0.025**** | **-0.031***** | **0.021** | **-0.035*** | **-0.023*** |
| | *(0.011)* | *(0.011)* | *(0.040)* | *(0.020)* | *(0.012)* |
| **(old_dep_ratio * floating)** | **0.018** | **0.028*** | **-0.048** | **0.066***** | **0.007** |
| | *(0.015)* | *(0.015)* | *(0.045)* | *(0.024)* | *(0.016)* |
| **Number of observations** | **255** | **139** | **116** | **113** | **142** |
| **Number of countries** | **99** | **49** | **50** | **63** | **78** |
| **$R^2$** | **0.38** | **0.31** | **0.39** | **0.30** | **0.47** |

**Note:** Columns (1)–(5) estimate equation (2) in the main text of the paper. Column (1) covers the full sample of 99 countries. Column (2) limits the sample to the richest 49 countries. Column (3) limits the sample to the poorest 50 countries. Column (4) limits the sample to the period 1976–1990. Column (5) limits the sample to the period 1991–2005. All regressions report standard errors which are heteroscedasticity-consistent, as well as robust to clustering. Standard errors are reported in parentheses. ***, **, *, denote statistical significance at the 1 per cent, 5 per cent, 10 per cent, 12 per cent level, respectively. All regressions include time-fixed effects (coefficients not reported).

Table 5

## THE IMPACT OF EXCHANGE RATE REGIMES ON CURRENT ACCOUNT DYNAMICS – PART III

### (TREATMENT EFFECTS MODEL, MAXIMUM LIKELIHOOD)

| A. Treatment equation | | B. Primary equation | |
|---|---|---|---|
| **Dependent variable: Floating** | | **Dependent variable: Current_account** | |
| **Sample** | **Full** | **Sample** | **Full** |
| **Independent variables** | | **Independent variables** | |
| **Constant** | **0.293** | **Constant** | **-0.067** |
| | *(0.187)* | | *(0.118)* |
| **Financial_openness** | **-0.150**** | **Floating** | **0.160** |
| | *(0.069)* | | *(0.270)* |
| **Trade_openness** | **-0.503** | **NFA** | **0.036***** |
| | *(0.346)* | | *(0.006)* |
| **Size** | **0.310***** | **(NFA * floating)** | **-0.032**** |
| | *(0.061)* | | *(0.013)* |
| **Number of observations** | **253** | **Relative_income** | **0.025***** |
| **Number of countries** | **97** | | *(0.006)* |
| | | **(relative_income * floating)** | **-0.035***** |
| | | | *(0.011)* |
| | | **Relative_growth** | **0.048** |
| | | | *(0.117)* |
| | | ***(relative_growth * floating)*** | ***-0.104*** |
| | | | **(0.267)** |
| | | **Budget** | **0.316***** |
| | | | *(0.108)* |
| | | **(budget * floating)** | **-0.054** |
| | | | *(0.155)* |
| | | **Old_dep_ratio** | **-0.028***** |
| | | | *(0.009)* |
| | | **(old_dep_ratio * floating)** | **0.036**** |
| | | | *(0.015)* |
| | | **Number of observations** | **253** |
| | | **Number of countries** | **97** |

**Note:** This table estimates the treatment effects model, presented in equations (3) – (6) in the main text of the paper. The table reports standard errors which are heteroscedasticity-consistent, as well as robust to clustering. Standard errors are reported in parentheses. ***, **, * denote statistical significance at the 1 per cent, 5 per cent, 10 per cent, respectively. The primary equation includes time-fixed effects (coefficients not reported).

Table 6

## THE IMPACT OF EXCHANGE RATE REGIMES ON CURRENT ACCOUNT DYNAMICS – PART IV

### (PANEL REGRESSIONS, OLS WITH TIME-FIXED EFFECTS)

| Dependent variable: Current_account<br>Omitted_variable<br>Independent variables | (1)<br>Financial openness | (2)<br>Trade openness | (3)<br>Financial depth | (4)<br>Size | (5)<br>Inflation |
|---|---|---|---|---|---|
| Constant | -0.061 | -0.320 | 0.102 | 0.101 | -0.205 |
| | (0.140) | (0.256) | (0.213) | (0.216) | (0.174) |
| Omitted_variable | 0.051 | 0.339 | -0.366 | 0.028 | 1.966 |
| | (0.101) | (0.341) | (0.370) | (0.067) | (1.367) |
| Floating | 0.004 | 0.126 | -0.031 | -0.057 | -0.158 |
| | (0.285) | (0.272) | (0.294) | (0.238) | (0.287) |
| NFA0.034*** | 0.080*** | 0.036*** | -0.010 | 0.023** | |
| | (0.009) | (0.010) | (0.012) | (0.021) | (0.012) |
| (NFA * omitted_variable) | -0.002 | -0.054*** | 0.000 | -0.010** | 0.026 |
| | (0.005) | (0.009) | (0.034) | (0.005) | (0.021) |
| (NFA * floating) | -0.005 | -0.025* | -0.016 | -0.002 | 0.002 |
| | (0.017) | (0.014) | (0.017) | (0.018) | (0.017) |
| Relative_income | 0.033*** | 0.019 | 0.039*** | 0.019** | 0.029*** |
| | (0.010) | (0.013) | (0.011) | (0.008) | (0.009) |
| (relative_income * omitted_variable) | 0.000 | 0.015* | -0.036 | -0.001 | 0.010 |
| | (0.004) | (0.009) | (0.022) | (0.002) | (0.053) |
| (relative_income * floating) | -0.022* | -0.021* | -0.020* | -0.033*** | -0.022** |
| | (0.012) | (0.012) | (0.011) | (0.011) | (0.011) |
| Relative_growth | 0.052 | 0.320 | -0.111 | -0.092 | 0.187 |
| | (0.138) | (0.253) | (0.203) | (0.215) | (0.173) |
| (relative_growth * omitted_variable) | -0.055 | -0.347 | 0.370 | -0.026 | -1.909 |
| | (0.101) | (0.337) | (0.356) | (0.065) | (1.327) |
| (relative_growth * floating) | -0.014 | -0.136 | 0.019 | 0.039 | 0.157 |
| | (0.284) | (0.272) | (0.292) | (0.236) | (0.288) |
| Budget0.340*** | 0.248 | 0.208 | 0.114 | 0.413* | |
| | (0.106) | (0.262) | (0.216) | (0.182) | (0.217) |
| (budget * omitted_variable) | 0.031 | 0.123 | 0.450 | -0.074 | -0.532 |
| | (0.084) | (0.329) | (0.403) | (0.062) | (1.394) |
| (budget * floating) | -0.268* | -0.218 | -0.313* | -0.056 | -0.184 |
| | (0.154) | (0.171) | (0.172) | (0.156) | (0.147) |
| Old_dep_ratio | -0.029** | -0.011 | -0.056*** | -0.028** | -0.026** |
| | (0.012) | (0.019) | (0.021) | (0.011) | (0.011) |
| (old_dep_ratio * omitted_variable) | 0.000 | -0.025 | 0.067 | 0.004 | -0.031 |
| | (0.005) | (0.016) | (0.048) | (0.003) | (0.082) |
| (old_dep_ratio * floating) | 0.025 | 0.019 | 0.023 | 0.041*** | 0.021 |
| | (0.016) | (0.016) | (0.015) | (0.014) | (0.016) |
| Number of observations | 253 | 255 | 230 | 255 | 255 |
| Number of countries | 97 | 99 | 89 | 99 | 99 |
| $R^2$ | 0.38 | 0.43 | 0.39 | 0.44 | 0.40 |

**Note:** Columns (1) – (5) estimate equation (2) in the main text of the paper. All regressions report standard errors which are heteroscedasticity-consistent, as well as robust to clustering. Standard errors are reported in parentheses. ***, **, *, denote statistical significance at the 1 per cent, 5 per cent, 10 per cent, 12 per cent level, respectively. All regressions include time-fixed effects (coefficients not reported).

Table 7

## A COUNTERFACTUAL SIMULATION EXERCISE

(per cent)

| Country | Period | Actual CA balance (of GDP) | Fitted CA balance (of GDP) | Counterfactual CA balance (floating ERR) (of GDP) | Increase in CA imbalance under 'Fitted\relative to 'Counterfactual' (of GDP) |
|---|---|---|---|---|---|
| Argentina | 1991–1995 | -2.5 | -1.6 | -1.8 | -0.1 |
| Argentina | 1996–2000 | -3.8 | -2.3 | -2.9 | -0.6 |
| Austria | 1991–1995 | -0.9 | -0.4 | -1.7 | -1.3 |
| Austria | 2001–2005 | 0.0 | 0.0 | -1.8 | -1.8 |
| Bahrain | 1981–1985 | 6.7 | 3.9 | 1.0 | 2.9 |
| Bahrain | 1986–1990 | -1.3 | 6.8 | 4.4 | 2.5 |
| Bahrain | 1991–1995 | -7.5 | 4.9 | 2.0 | 2.9 |
| Bahrain | 1996–2000 | 0.2 | 4.7 | 1.2 | 3.5 |
| Bahrain | 2001–2005 | 4.1 | 5.0 | 1.9 | 3.1 |
| Belgium | 2001–2005 | 3.8 | 2.3 | 0.4 | 1.9 |
| Benin | 1976–1980 | -6.7 | -3.1 | -1.2 | 1.8 |
| Bolivia | 1976–1980 | -7.0 | -5.7 | -3.0 | 2.8 |
| Botswana | 1976–1980 | -10.5 | -5.8 | -2.5 | 3.3 |
| Botswana | 1981–1985 | -9.3 | 4.2 | 0.7 | 3.4 |
| Botswana | 1986–1990 | 12.5 | 5.0 | 2.2 | 2.7 |
| Botswana | 1991–1995 | 6.8 | 5.2 | 1.8 | 3.4 |
| Botswana | 1996–2000 | 9.3 | 3.6 | 1.0 | 2.7 |
| Botswana | 2001–2005 | 7.1 | 3.0 | 1.3 | 1.7 |
| Bulgaria | 2001–2005 | -6.1 | -5.1 | -2.7 | 2.3 |
| Burkina Faso | 1976–1980 | -4.1 | -3.2 | -1.1 | 2.0 |
| Burkina Faso | 1981–1985 | -3.1 | -4.2 | -2.2 | 1.9 |
| Burkina Faso | 1986–1990 | -0.7 | -2.3 | -0.8 | 1.4 |
| Burkina Faso | 1991–1995 | -1.5 | -3.4 | -2.1 | 1.4 |
| Burkina Faso | 1996–2000 | -12.3 | -3.6 | -3.0 | 0.6 |
| Burkina Faso | 2001–2005 | -10.3 | -4.6 | -3.0 | 1.6 |
| Cameroon | 1976–1980 | -3.9 | -3.4 | -1.5 | 1.9 |
| Cameroon | 1981–1985 | -5.2 | -3.9 | -2.1 | 1.8 |
| Cameroon | 1986–1990 | -4.5 | -2.4 | -1.3 | 1.2 |
| Cameroon | 1991–1995 | -2.0 | -4.0 | -3.1 | 0.9 |
| Cameroon | 1996–2000 | -3.4 | -5.2 | -4.8 | 0.4 |
| Chad | 1976–1980 | -1.5 | -4.5 | -2.4 | 2.1 |
| Chad | 1981–1985 | 0.4 | -4.7 | -2.6 | 2.2 |
| Chad | 1986–1990 | -2.4 | -2.6 | -1.1 | 1.5 |
| Chad | 1991–1995 | -4.8 | -6.0 | -3.4 | 2.6 |
| China | 1996–2000 | 2.3 | -3.2 | -2.4 | 0.8 |
| China | 2001–2005 | 3.5 | -3.2 | -1.6 | 1.6 |
| Congo, Republic of | 1976–1980 | -12.9 | -7.1 | -3.7 | 3.4 |
| Congo, Republic of | 1981–1985 | -11.1 | -8.1 | -4.7 | 3.4 |

(continued)

(continued)

| Country | Period | Actual CA balance (of GDP) | Fitted CA balance (of GDP) | Counterfactual CA balance (floating ERR) (of GDP) | Increase in CA imbalance under 'Fitted\relative to 'Counterfactual' (of GDP) |
|---|---|---|---|---|---|
| Congo, Republic of | 1991–1995 | -26.2 | -11.9 | -8.0 | 3.9 |
| Congo, Republic of | 1996–2000 | -6.9 | -14.7 | -11.6 | 3.1 |
| Congo, Republic of | 2001–2005 | 9.1 | -6.4 | -5.7 | 0.7 |
| Costa Rica | 1976–1980 | -11.3 | -5.1 | -2.9 | 2.2 |
| Cote d'Ivoire | 1991–1995 | -6.4 | -7.9 | -5.9 | 2.0 |
| Cote d'Ivoire | 1996–2000 | -1.6 | -6.0 | -5.5 | 0.5 |
| Denmark | 1976–1980 | -2.1 | -1.5 | -1.5 | -0.0 |
| Denmark | 1981–1985 | -3.4 | -3.7 | -3.1 | 0.5 |
| Denmark | 1986–1990 | -1.8 | 1.3 | -0.6 | -1.9 |
| Denmark | 1991–1995 | 2.2 | -0.6 | -2.2 | -1.6 |
| Denmark | 1996–2000 | 0.8 | 1.4 | -2.0 | -3.4 |
| Dominican Republic | 1976–1980 | -5.9 | -3.3 | -1.8 | 1.5 |
| Dominican Republic | 1981–1985 | -3.9 | -4.0 | -3.0 | 1.1 |
| Ecuador | 1976–1980 | -5.2 | -4.0 | -2.0 | 2.0 |
| Ecuador | 2001–2005 | -2.3 | -6.4 | -4.7 | 1.7 |
| Egypt | 1976–1980 | -5.5 | -9.0 | -3.4 | 5.5 |
| Egypt | 1981–1985 | -5.8 | -8.9 | -4.9 | 3.9 |
| El Salvador | 2001–2005 | -3.4 | -4.4 | -3.0 | 1.4 |
| Estonia | 1996–2000 | -7.9 | -3.6 | -2.5 | 1.1 |
| Estonia | 2001–2005 | -10.5 | -4.1 | -2.6 | 1.4 |
| Ethiopia | 1981–1985 | -1.7 | -5.8 | -3.2 | 2.6 |
| Ethiopia | 1986–1990 | -2.2 | -3.2 | -1.2 | 2.1 |
| Finland | 1981–1985 | -1.3 | -1.7 | -2.1 | -0.4 |
| Finland | 1986–1990 | -3.1 | 2.2 | 0.3 | 2.0 |
| Finland | 1991–1995 | -1.3 | -3.9 | -3.4 | 0.5 |
| Finland | 1996–2000 | 5.7 | -0.7 | -2.8 | -2.1 |
| Finland | 2001–2005 | 7.4 | -3.8 | -5.1 | -1.2 |
| France | 1991–1995 | 0.3 | -0.6 | -1.7 | -1.1 |
| France | 2001–2005 | 0.3 | 0.2 | -1.2 | -1.4 |
| Gabon | 1976–1980 | 6.7 | -5.1 | -3.4 | 1.7 |
| Gabon | 1981–1985 | 4.0 | -3.5 | -2.9 | 0.7 |
| Gabon | 1986–1990 | -12.5 | -1.5 | -1.2 | 0.3 |
| Gabon | 1991–1995 | 3.0 | -3.6 | -3.2 | 0.4 |
| Germany | 2001–2005 | 2.4 | -1.0 | -1.7 | -0.7 |
| Ghana | 1976–1980 | -0.5 | -6.0 | -2.8 | 3.2 |
| Ghana | 1996–2000 | -7.5 | -5.2 | -4.5 | 0.8 |
| Greece | 1996–2000 | -5.5 | -4.0 | -3.2 | 0.7 |
| Greece | 2001–2005 | -7.3 | -5.1 | -3.4 | 1.7 |
| Guatemala | 1976–1980 | -2.5 | -2.7 | -1.2 | 1.5 |
| Guatemala | 1981–1985 | -4.0 | -4.2 | -2.8 | 1.5 |
| Haiti | 1976–1980 | -4.3 | -4.5 | -1.9 | 2.6 |
| Haiti | 1981–1985 | -6.8 | -5.6 | -3.3 | 2.3 |
| Haiti | 1986–1990 | -1.7 | -2.2 | -1.0 | 1.2 |

(continued)

(continued)

| Country | Period | Actual CA balance (of GDP) | Fitted CA balance (of GDP) | Counterfactual CA balance (floating ERR) (of GDP) | Increase in CA imbalance under 'Fitted\relative to 'Counterfactual' (of GDP) |
|---|---|---|---|---|---|
| Honduras | 1976–1980 | -8.9 | -3.7 | -1.8 | 1.9 |
| Honduras | 1981–1985 | -8.3 | -7.3 | -4.4 | 2.9 |
| Honduras | 1986–1990 | -3.3 | -3.3 | -1.9 | 1.4 |
| Iceland | 1991–1995 | -0.6 | -0.2 | -2.5 | -2.3 |
| Iceland | 1996–2000 | -5.4 | 1.6 | -2.3 | -4.0 |
| Iceland | 2001–2005 | -6.9 | 1.3 | -2.0 | -3.3 |
| Indonesia | 1986–1990 | -2.6 | -1.6 | -0.5 | 1.2 |
| Iran | 1981–1985 | 0.2 | -3.4 | -1.9 | 1.5 |
| Iran | 1986–1990 | -1.1 | -1.0 | -0.2 | 0.9 |
| Iran | 1991–1995 | 1.4 | -0.3 | -0.7 | -0.4 |
| Iran | 1996–2000 | 4.7 | -1.6 | -2.2 | -0.5 |
| Ireland | 1986–1990 | -1.1 | -2.6 | -2.1 | 0.5 |
| Ireland | 1991–1995 | 2.1 | -1.5 | -2.2 | -0.8 |
| Ireland | 1996–2000 | 1.2 | 2.2 | -1.4 | -3.6 |
| Ireland | 2001–2005 | -0.9 | 4.1 | -0.2 | -4.3 |
| Italy | 1996–2000 | 1.5 | -1.0 | -2.5 | -1.4 |
| Italy | 2001–2005 | -0.9 | -2.0 | -2.1 | -0.1 |
| Jamaica | 1976–1980 | -3.9 | -11.5 | -6.1 | 5.5 |
| Jamaica | 1981–1985 | -11.4 | -11.9 | -6.7 | 5.2 |
| Jordan | 1976–1980 | -0.1 | -4.4 | -0.9 | 3.5 |
| Jordan | 1981–1985 | -5.2 | -3.8 | -2.0 | 1.8 |
| Jordan | 1996–2000 | 0.6 | -4.5 | -4.3 | 0.1 |
| Jordan | 2001–2005 | -0.2 | -3.3 | -2.5 | 0.8 |
| Kenya | 1976–1980 | -7.0 | -5.1 | -2.2 | 2.9 |
| Korea | 1976–1980 | -3.6 | -3.4 | -1.8 | 1.6 |
| Latvia | 1996–2000 | -6.8 | -4.3 | -2.7 | 1.6 |
| Latvia | 2001–2005 | -9.6 | -5.0 | -2.6 | 2.4 |
| Lebanon | 2001–2005 | -19.1 | -8.8 | -5.0 | 3.8 |
| Lithuania | 1996–2000 | -9.5 | -4.4 | -3.0 | 1.4 |
| Lithuania | 2001–2005 | -6.3 | -4.4 | -2.6 | 1.9 |
| Luxembourg | 2001–2005 | 10.1 | 12.4 | 3.6 | 8.9 |
| Malawi | 1976–1980 | -18.0 | -7.1 | -3.3 | 3.8 |
| Mali | 1976–1980 | -6.0 | -4.7 | -2.4 | 2.4 |
| Mali | 1981–1985 | -10.2 | -6.8 | -4.1 | 2.8 |
| Mali | 1986–1990 | -11.0 | -5.3 | -3.2 | 2.2 |
| Mali | 1991–1995 | -8.7 | -5.8 | -4.1 | 1.7 |
| Mali | 1996–2000 | -9.1 | -6.0 | -4.9 | 1.0 |
| Mali | 2001–2005 | -7.7 | -7.0 | -4.8 | 2.2 |
| Mexico | 1991–1995 | -5.0 | -0.4 | -1.6 | -1.3 |
| Namibia | 1991–1995 | 3.5 | -1.8 | -1.6 | 0.1 |
| Namibia | 1996–2000 | 5.5 | -1.4 | -1.9 | -0.5 |
| Nepal | 1976–1980 | -0.6 | -3.8 | -1.4 | 2.5 |
| Netherlands | 1991–1995 | 3.8 | 2.1 | -0.5 | -2.5 |

(continued)

(continued)

| Country | Period | Actual CA balance (of GDP) | Fitted CA balance (of GDP) | Counterfactual CA balance (floating ERR) (of GDP) | Increase in CA imbalance under 'Fitted\relative to 'Counterfactual' (of GDP) |
|---|---|---|---|---|---|
| Netherlands | 2001–2005 | 5.4 | 0.8 | -1.6 | -2.4 |
| New Zealand | 1976–1980 | -4.1 | -3.0 | -2.3 | 0.7 |
| New Zealand | 1981–1985 | -8.0 | -4.1 | -3.2 | 0.9 |
| New Zealand | 1991–1995 | -3.3 | -1.3 | -2.5 | -1.2 |
| New Zealand | 1996–2000 | -5.4 | -2.2 | -4.2 | -2.0 |
| Nicaragua | 1991–1995 | -29.7 | -22.8 | -19.0 | 3.8 |
| Nicaragua | 1996–2000 | -23.0 | -12.1 | -10.5 | 1.7 |
| Niger | 1976–1980 | -7.6 | -3.9 | -1.5 | 2.3 |
| Nigeria | 1996–2000 | 3.2 | -7.5 | -6.2 | 1.3 |
| Norway | 1981–1985 | 3.5 | -1.0 | -2.1 | -1.0 |
| Norway | 1991–1995 | 3.5 | 1.0 | -1.3 | -2.3 |
| Norway | 1996–2000 | 6.8 | 3.7 | -0.9 | -4.6 |
| Oman | 1976–1980 | 8.0 | 0.0 | -0.1 | -0.1 |
| Oman | 1981–1985 | 6.6 | -1.7 | -1.0 | 0.7 |
| Oman | 1986–1990 | 1.0 | 0.4 | -0.1 | -0.5 |
| Oman | 1991–1995 | -5.7 | -0.3 | -1.1 | -0.7 |
| Oman | 1996–2000 | -1.8 | -0.1 | -2.2 | -2.0 |
| Pakistan | 1976–1980 | -4.8 | -6.9 | -3.1 | 3.9 |
| Panama | 1976–1980 | -8.9 | -9.5 | -5.8 | 3.6 |
| Panama | 1981–1985 | -3.0 | -8.6 | -5.8 | 2.8 |
| Panama | 1986–1990 | 5.8 | -4.1 | -3.1 | 1.0 |
| Panama | 1991–1995 | -3.0 | -3.4 | -3.4 | -0.1 |
| Panama | 1996–2000 | -6.5 | -3.7 | -3.9 | -0.1 |
| Papua New Guinea | 1981–1985 | -13.5 | -4.8 | -3.1 | 1.8 |
| Papua New Guinea | 1986–1990 | -5.9 | -3.4 | -2.4 | 1.0 |
| Papua New Guinea | 1991–1995 | 7.3 | -5.6 | -4.2 | 1.4 |
| Paraguay | 1976–1980 | -4.7 | -2.6 | -0.9 | 1.7 |
| Portugal | 1986–1990 | 0.4 | -3.9 | -2.1 | 1.8 |
| Portugal | 1991–1995 | -0.6 | -3.4 | -2.4 | 0.9 |
| Portugal | 1996–2000 | -7.3 | -2.7 | -2.8 | -0.1 |
| Portugal | 2001–2005 | -8.0 | -4.0 | -3.2 | 0.9 |
| Rwanda | 1976–1980 | 0.1 | -2.8 | -0.7 | 2.1 |
| Rwanda | 1981–1985 | -4.3 | -3.9 | -2.0 | 1.9 |
| Rwanda | 1986–1990 | -4.5 | -2.2 | -0.8 | 1.4 |
| Saudi Arabia | 1996–2000 | -0.1 | 2.1 | -0.6 | -2.7 |
| Senegal | 1976–1980 | -8.3 | -4.3 | -2.1 | 2.2 |
| Senegal | 1981–1985 | -13.4 | -6.7 | -3.9 | 2.8 |
| Slovenia | 1996–2000 | -1.2 | -1.2 | -2.0 | -0.7 |
| Slovenia | 2001–2005 | -0.8 | -2.1 | -1.9 | 0.2 |
| South Africa | 1976–1980 | 1.4 | -2.7 | -2.2 | 0.5 |
| Spain | 1996–2000 | -1.7 | -1.8 | -2.7 | -0.9 |
| Spain | 2001–2005 | -4.7 | -1.3 | -2.0 | -0.7 |
| Swaziland | 1976–1980 | -11.7 | -3.0 | -1.4 | 1.7 |

(continued)

(continued)

| Country | Period | Actual CA balance (of GDP) | Fitted CA balance (of GDP) | Counterfactual CA balance (floating ERR) (of GDP) | Increase in CA imbalance under 'Fitted\relative to 'Counterfactual' (of GDP) |
|---|---|---|---|---|---|
| Swaziland | 1981–1985 | -16.0 | -5.9 | -3.8 | 2.1 |
| Swaziland | 1986–1990 | 8.8 | 0.2 | 0.0 | -0.3 |
| Swaziland | 1991–1995 | -1.4 | -0.7 | -1.0 | -0.3 |
| Swaziland | 1996–2000 | -3.8 | -0.4 | -1.4 | -1.0 |
| Swaziland | 2001–2005 | 2.5 | -0.9 | -0.5 | 0.4 |
| Syria | 1976–1980 | 2.0 | -4.6 | -1.8 | 2.9 |
| Syria | 1981–1985 | -3.7 | -5.3 | -3.1 | 2.2 |
| Syria | 1986–1990 | 3.8 | -1.7 | -1.1 | 0.6 |
| Syria | 1991–1995 | -0.2 | -3.9 | -3.2 | 0.6 |
| Syria | 1996–2000 | 2.2 | -4.8 | -4.8 | -0.1 |
| Thailand | 1976–1980 | -5.4 | -3.7 | -1.3 | 2.3 |
| Togo | 2001–2005 | -10.3 | -6.6 | -4.8 | 1.8 |
| Trinidad and Tobago | 1976–1980 | 4.6 | 0.2 | -0.4 | -0.6 |
| Trinidad and Tobago | 1981–1985 | -4.1 | -3.7 | -2.7 | 1.0 |
| Uganda | 1996–2000 | -5.0 | -4.0 | -3.4 | 0.6 |
| Uganda | 2001–2005 | -4.8 | -4.2 | -2.7 | 1.5 |
| Venezuela | 1976–1980 | -2.3 | -0.3 | -0.1 | 0.1 |
| Venezuela | 1981–1985 | 3.9 | -2.1 | -2.1 | -0.0 |
| Yemen | 1991–1995 | -9.3 | -6.6 | -4.0 | 2.6 |
| Zambia | 1976–1980 | -7.0 | -9.2 | -4.6 | 4.6 |
| Zambia | 1996–2000 | -12.9 | -11.5 | -9.2 | 2.4 |
| Zimbabwe | 1991–1995 | -5.5 | -3.6 | -2.7 | 0.9 |
| **Average** | | **-3.1** | **-3.1** | **-2.5** | **1.1** |

**Note:** The fitted values for current account balances reported in column (4) are based on the coefficient estimates reported in Column (3) of Table 3. The counterfactual values for current account balances reported in column (5) are based on the coefficient estimates reported in Column (5) of Table 3. The shaded rows in the table correspond to those countries and periods for which the ratio of column (4) to column (5) is less than unity.

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# Econometric Forecasting of Bulgaria's Export and Import Flows

Grigor Stoevsky

**Abstract.** The study comprises an empirical analysis of Bulgaria's foreign trade, aimed at projecting the export and import dynamics of the country. The forecasting objective of the study restricts econometric specifications to include primarily explanatory factors for which external assumptions on their likely future development are available. The relatively long transition period and the associated structural changes shorten the available time series and raise specific econometric issues.
An important conclusion of the study is that the modeling approach developed produces forecasts that are only reliable over a short horizon and may serve but an auxiliary function to a full-fledged macroeconomic projections model.

**Резюме.** Изследването обхваща емпиричен анализ на българската външна търговия, чиято цел е да прогнозира динамиката на износа и вноса на страната. Прогностичната задача на изследването ограничава иконометричните спецификации, така че да се включат главно обяснителни фактори, за които е налице външно допускане за вероятното им бъдещо развитие. Сравнително дългият преходен период и свързаните с него структурни промени скъсяват наличните динамични статистически редове и пораждат специфични иконометрични проблеми.
Важен извод от изследването е, че с приложения подход на моделиране се получава прогноза, която е надеждна само в кратък хоризонт и може да изпълнява само спомагателна функция спрямо един цялостен макроикономически прогностичен модел

This paper is based on the results from a research project at the Bulgarian National Bank completed together with Andrey Vassilev and Svilen Pachedjiev. I am particularly indebted to Andrey Vassilev for providing ideas and comments throughout the process.

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## Contents

## Introduction

Traditionally in empirical analysis of economic relations, one of two broad approaches is followed. According to the first, a theoretical model is built, based on certain assumptions about the underlying processes, which is reduced to an estimable representation and then tested with the available data for a particular country. The objectives of this approach usually are to assess the applicability of the given model for the specific country, to give recommendations about future model modifications, as well as to evaluate the existence of certain relations. According to the second approach, the objective is not to test a specific model, but rather to evaluate as accurately as possible existing empirical relations between the processes of interest. The starting point of the analysis is theoretically postulated or empirically derived in different circumstances relations, based on which reduced-form estimable equations are built and tested with the country-specific dataset of interest. The focus is on the empirical estimation of these relations and the usual procedure to follow is the so-called "general-to-specific" strategy. The main task in this second approach is to extract maximum amount of information from the available data about the relations between the processes, following a number of econometric rules and procedures guaranteeing the reliability of the obtained results. It is this latter approach which we follow in the research paper.

The main objective of the study is to perform an empirical analysis of Bulgaria's foreign trade, aimed at projecting the export and import dynamics of Bulgaria. It is motivated by the need of producing a reliable assessment of the foreign trade development of the country and allowing better forecasting of the other balance of payments components as well. Logically the forecasting is preceded by an analysis of the relations between the macroeconomic processes. The forecasting objective of the study restricts econometric specifications to include primarily explanatory factors for which external assumptions on their likely future development are available. The relatively long period of transition in Bulgaria and the associated structural changes shorten the available time series and raise specific econometric issues. These characteristics limit the applicability and reliability of standard stationarity tests, on the one hand, and on the other land, hinder the estimation of long-term relationships, thus naturally restricting the forecasting horizon to up to one year ahead.

The fulfillment of the so-defined objective requires the realization of the following specific tasks:

• Choosing the appropriate methodological framework, defining the theoretical relations between the macroeconomic processes, which are the basis for the empirical analysis;

• Collecting and transforming the data for the key variables in a form appropriate for econometric testing. Assessment of the time-series properties of the data, in particular their stationarity and autocorrelation structure;

• Econometric estimation of the relations between the variables following the "general-to-specific" approach and finding parsimonious specifications;

• Applying a series of tests for significance, stability and reliability of the reduced-form models and the estimated coefficients;

• Performing in-sample and out-of-sample forecasts and analysis of the forecasting power of the models.

The initial hypotheses of the author are the following:

• The physical volume of Bulgarian exports should exhibit a positive relation with the external demand dynamics and the real depreciation of the Bulgarian lev;

• The price dynamics of the exported and imported goods is characterized by inertia and depends on the dynamics of the international prices and the exchange rates;

• The physical volume of the imports should depend on the economic activity in the country and the dynamics of the real effective exchange rate.

The development of satellite instruments for forecasting the export and import flows of the country is motivated by the importance of the trade balance both in the external transactions and in the national accounts. The balance of goods is one of the main components of the current account of the balance of payments, and given the currency board arrangement in Bulgaria, is a direct determinant of the foreign reserves of the central bank. The private agents decisions to consume (use in production) imported goods, as well as to export their products to the international markets depend on their financial potential and their competitiveness.

The foreign trade is also an important component of the final use approach to the GDP developments. The existence of trade deficits for a relatively long period of time might under some circumstances be a risk factor for the future growth prospects. On the other hand, the deficits might represent the process of capital accumulation and through the intensified investments increase the growth potential of the country. In all cases, developing an alternative instrument for short run export and import forecasting is justified by the need of providing better analysis and forming more accurate expectations about the economic development of the country.

The paper is organized in the following way: Section 1 presents the theoretical approaches and relations, forming the basis for the empirical estimation. A sample of research studies testing similar relations for other economies is also presented. Section 2 describes the variables used in the analysis and

their time-series properties. The reduced-form specifications are given in Section 3, whereas the forecasting performance of the equations is discussed in Section 4. The paper concludes with some options for improvement of this empirical work in the future.

## 1. Theoretical Grounds and Recent Empirical Studies

The contemporary foreign trade theory encompasses a wide variety of research problems, analyzes the relations and causality between a number of economic processes and provides an ample field for empirical work. A large part of the traditional theory is focused on the causes of the foreign trade development and its consequences. The increasingly integrated world and the trend towards higher openness and interdependence between the countries led towards the incorporation of open economy features in almost all models for macroeconomic analysis and forecasting. In empirical work, however, there is always a trade-off between theoretical consistency and practical relevance. As the approach followed in the current research effort is one of econometric estimation of the existing economic relations, the balance between theory and empirical relevance is in favour of the latter.

The classical international trade theory includes the Ricardian, technology-based model and the Heckscher-Ohlin factor endowments model. More recently, the foreign trade factors and driving forces were expanded to include increasing returns to scale, monopolistic competition, preference for variety, market failures, while the predicted specialization is one of intra-industry trade. Gravity and endogenous growth models also contributed to the theoretical advances along with the theory of competitive advantage.[1]

Examples of empirical foreign trade studies, relevant to the presented work, include Amano and Wirjanto (1994), Senhadji and Montenegro (1999), Mehta and Mathur (2003), Bussiere, Fidrmuc and Schnatz (2005), Anderton, Baltagi, Skudelni and Sousa (2005) among others. The authors of the first study model the Canadian foreign trade flows as a function of the agents' decisions in solving a dynamic optimization problem. The desired level of imports in their setup is a linear function of domestic demand and relative prices, and the solution of the problem leads to an Euler equation for imports. The coefficients of this equation are estimated in two steps, with co-integration techniques at the first and generalized method of moments (GMM) at the second. The estimated import elasticities with respect to (w.r.t.) domestic

[1] Grossman and Helpman (1991), Porter (1990). Textbooks such as Obstfeld and Rogoff (1996) and Feenstra (2003) present the theory in a systematic and consistent manner.

demand and relative prices are respectively 1.5 and -0.5. Although the method provides micro foundations for the empirical estimation of macroeconomic relations, the co-integration and GMM methods are practically inapplicable to small samples.

Senhadji and Montenegro (1999) analyze the exports of 75 countries using the fully modified estimator of Phillips and Hansen (1990) in estimating the relations. The results about the export elasticity w.r.t. relative prices show an insignificant relation in the short run and a coefficient close to 1 in the long run. The export elasticities w.r.t. the income of the trade partners are generally below 0.5 in the short run and around 1.5 in the long run. One of the conclusions of the study is that the export elasticities are lower in the industrial countries as compared to the developing countries.

Mehta and Mathur (2003) review the existing models for short run forecasting of Indian exports. The exports are generally modeled as a function of the demand of the trade partners of India and the development in relevant price indexes and exchange rates along with its autoregressive structure. Bussiere, Fidrmuc and Schnatz (2005) analyze the trade integration of the Central and Eastern European (CEE) countries with the euro area using an augmented gravity model. In the panel data estimation, they find a significantly positive trade dependence on the economy size (GDP), neighbourhood, language similarity, trade union membership, price effect (captured by the real exchange rate dynamics), while the distance influences negatively the trade flows. An example of an alternative econometric approach is provided by Anderton, Baltagi, Skudelni and Sousa (2005) who use the three-stage least squares (3SLS) system estimator for analyzing the import demand of nine Eurosystem countries.

Based on the fundamental theoretical relations, describing the export and import dynamics of a country, as well as on the variety of empirical methods for studying the foreign trade determinants and forecasting its developments, we analyzed the following relations for the Bulgarian economy:

- The export modeling has the following general form:

$$X_t = f(X_{t-i}, ED_{t-i+1}, ER_{t-i+1}, \mathbf{P_{t-i+1}}), i = \{1,2,3,...\} \quad (1),$$

where *X* is the export of goods (expressed in nominal or real terms), *ED* is a composite measure of external demand, *ER* is the exchange rate (nominal or real, effective or not), and **P** is a vector of prices, giving the price dynamics for groups of commodities on the international markets.

• The general form for the import modeling is:

$$M_t = f(M_{t-i}, DD_{t-i+1}, Y_{t-i+1}, ER_{t-i+1}, \mathbf{P_{t-i+1}}), i = \{1,2,3,...\} \quad (2),$$

where *M* is the imports of goods (expressed in nominal or real terms), *DD* is domestic demand, *Y* is the gross domestic product (GDP), *ER* is the exchange rate, and **P** is the price vector.

• The export and import deflator modeling is based on the understanding that Bulgaria is a small open economy, which is a price-taker on the international markets, hence the prices of the foreign traded goods should follow the dynamics on the international markets:[2]

$$P_t^{X,M} = f(P_{t-i}^{X,M}, ER_{t-i+1}, \mathbf{P_{t-i+1}}), i = \{1,2,3,...\} \quad (3),$$

where $P_t^{X,M}$ is the corresponding export or import deflator, while the other variables are as described above. The following section presents the macroeconomic processes included in the analysis and the statistical properties of the available time-series.

## 2. Data Properties

The empirical analysis of the foreign trade of Bulgaria aimed at projecting the future development of the export and import flows is based on econometric estimation of relations between macroeconomic processes selected on theoretical and logical grounds. The choice of explanatory variables in the export and import modeling is restricted by the forecasting objective of the analysis. Namely, the set of explanatory factors is restricted to those, for which external forecasts or assumptions on their likely development in the future are available. Those variables include domestic demand and GDP growth rates (based on the core macroeconomic projections model), GDP and price dynamics of Bulgaria's main trading partners, international prices of basic commodities and exchange rates.

The time horizon of the forecast is restricted to one year ahead due to the specifics of the Bulgarian transition period. The relatively long period of transformation of the economic system, the ongoing structural changes and the crisis of 1996–1997 led to an abrupt change in the monetary regime with the introduction of a Currency Board Arrangement in July 1997. For this reason,

[2]The hypothesis is that the exporters are "price-takers" on the international markets whereas the importers are "price-makers" on the domestic market.

the time series span the period 1998–2007 and the additionally required data transformation shortens the available observations for some of the variables to the period 1999–2007. These characteristics of the data limit the applicability and reliability of standard stationarity tests, on the one hand, and on the other hand, hinder the estimation of long-term relationships, thus naturally restricting the forecasting horizon to up to one year ahead.

In econometric estimation with a sample of eight to nine years, the most suitable data frequency in our opinion is quarterly. At this periodicity, the short run noise present in the monthly data is eliminated and also it is the highest frequency for the national accounts data. Furthermore, the relatively short time span makes the annual data inappropriate for econometric estimation. Finally, the requirement of producing quarterly forecasts also guided the data choice.

One property of the quarterly reporting for most of the series is their seasonality. In order to cope with it in a straightforward way, we decided to work with annual growth rates (or annual differences) of the series. With such transformation the seasonality is removed while the short run relation is retained. If however the first difference of the series is used in some estimation, we account for seasonality through the inclusion of seasonal dummies. As most of the variables we analyze are flow processes (as opposed to stocks), the economic interpretation of their annual or chain difference is acceleration/deceleration or intensification/diminishing of their dynamics.

From statistical point of view, the transformation of the data into annual changes makes most of the series stationary. The stationarity of the series is important for the validity of the econometric estimation, the proper statistical significance of the coefficients and for the stability of the relations in different time horizons. It is the assumption of coefficient stability which allows out-of-sample forecasting of the dependent variable.

The main variables for the analysis are:

- Exports and imports of goods, quarterly data, defined as nominal and real annual growth rates as reported in the national accounts statistics;
- GDP and domestic demand (DD) growth rates, the latter comprises the final consumption of households and the government and the gross capital formation;
- External demand, defined as a GDP growth rate or import dynamics of Bulgaria's main partners weighted by their respective shares in Bulgaria's exports;
- International price indexes of basic commodities – crude oil and metals;
- Exchange rate USD/EUR (given the fixed BGN/EUR rate).

The unit root hypothesis is tested by two alternative methods, having a different null, namely the Augmented Dickey Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The results of the two methods are conclusive (qualitatively similar) for all key variables of the analysis and they are presented in Appendix 1. In interpreting the results, we had in mind that these tests are asymptotic and thus formally inapplicable to small samples. Nevertheless, we decided to have formal tests supporting the qualitative judgment about the stationarity of the series (the latter based on the stylized facts in this regard).

## 3. Reduced–form Specifications

The econometric procedure followed to find the best specification for each variable is the general-to-specific approach. The main idea of this approach is to start with a general specification of the model, which should pass a number of diagnostic tests. Then the specification is sequentially reduced by an exclusion of the least significant regressor (one at a step). At each step, the validity of the model is verified through a series of diagnostic tests. The procedure stops with a parsimonious model specification which cannot be further reduced without violating the validity of the model.

The choice of regressors for the initial general specification is guided by theory and logical considerations. The starting lag structure for the explanatory factors is based on the author's judgment about the relevant time span of the relation. Dummy variables are included to cope with seasonality (in one of the specifications), as well as to account for one-off factors, influencing the relation between the macroeconomic processes.

The set of diagnostic tests for each specification and at each step of the procedure includes analysis of the residuals and of the estimated coefficients. The former are tested for normality, serial correlation and heteroskedasticity, while the latter are tested for stability by recursive least squares. The residuals are also graphically examined for outliers. In applying these tests, the author followed the standard for empirical work significance levels (5%). Nevertheless, the small sample size and the specifics of the structural changes in the economy throughout the period postulate the use of a more flexible approach in deciding whether a particular specification passes or not a diagnostic test. In applying the procedure, one might reach a reduced-form specification, which does not pass the diagnostic tests. In such cases, the author repeated the procedure, following a different route and trying to find an alternative reduced-form specification. In some cases, a dummy variable is added for an outlier correction. It is in cases when the author takes the specification for adequate (in economic and statistical terms) but some data anomaly is

present. The final parsimonious model specifications should maximize the adjusted coefficient of determination and minimize the information criteria of Akaike and Schwarz.

The analysis of the export and import flows comprises the three interrelated data dimensions. Independently of each other are estimated and forecasted the nominal and real growth rates, as well as the respective deflators, in spite of the fact, that each of these variables might be implicitly computed for the other two. This approach allows the calculation of two independent forecasts for the variable of primary interest. For example, for the balance of payments projections the primary interest is on the nominal variables, whereas for the real sector projections the real growth rates are of a first order of importance.

Based on the application of the general-to-specific approach, the derived reduced-form equations for each dependent variable have the following form.

• The exports of goods are modeled as real, nominal and price dynamics. The external (import) demand measure is also modeled as an auxiliary equation. The regression equations are:

$$\frac{\Delta_4 X_t}{X_{t-4}} = \alpha_1 + \beta_1^1 \frac{\Delta_4 X_{t-1}}{X_{t-5}} + \beta_1^2 \frac{\Delta_4 ED_t^M}{ED_{t-4}^M} + \varepsilon_1 \quad (4)$$

$$\frac{\Delta_4 (P^X X)_t}{(P^X X)_{t-4}} = \alpha_2 + \beta_2^1 \frac{\Delta_4 (P^X X)_{t-1}}{(P^X X)_{t-5}} + \beta_2^2 \frac{\Delta_4 ED_t^M}{ED_{t-4}^M} + \beta_2^3 \frac{\Delta_4 ER_{t-1}^{\varepsilon/\$}}{ER_{t-5}^{\varepsilon/\$}} + \varepsilon_2 \quad (5)$$

$$\frac{\Delta_4 P_t^X}{P_{t-4}^X} = \alpha_3 + \beta_3^1 \frac{\Delta_4 P_{t-1}^X}{P_{t-5}^X} + \beta_3^2 \frac{\Delta_4 P_{t-4}^X}{P_{t-8}^X} + \beta_3^3 \frac{\Delta_4 P_t^{Oil}}{P_{t-4}^{Oil}} + \beta_3^4 \frac{\Delta_4 P_t^{Metals}}{P_{t-4}^{Metals}} + \beta_3^5 \frac{\Delta_4 ER_t^{\varepsilon/\$}}{ER_{t-4}^{\varepsilon/\$}} + \varepsilon_3 \quad (6)$$

$$\frac{\Delta_4 ED_t^M}{ED_{t-4}^M} = \alpha_4 + \beta_4^1 \frac{\Delta_4 ED_{t-1}^M}{ED_{t-5}^M} + \beta_4^2 \frac{\Delta_4 ED_{t-4}^M}{ED_{t-8}^M} + \beta_4^3 \frac{\Delta_4 ED_t^{GDP}}{ED_{t-4}^{GDP}} + \varepsilon_4 \quad (7),$$

where the superscripts *X* or *M* relate the variable to the exports or imports, *Oil* and *Metals* represent the respective price indexes of crude oil and metals, and the exchange rate is defined as euro per 1 USD.

• The modeling of the imports of goods also comprises real, nominal and price dynamics. Furthermore, an alternative specification is formulated in terms of chain differences of the variables in constant prices. The reduced-form specifications are:

$$\frac{\Delta_4 M_t}{M_{t-4}} = \alpha_5 + \beta_5^1 \frac{\Delta_4 M_{t-1}}{M_{t-5}} + \beta_5^2 \frac{\Delta_4 DD_t}{DD_{t-4}} + \beta_5^3 \frac{\Delta_4 DD_{t-1}}{DD_{t-5}} + \varepsilon_5 \qquad (8)$$

$$\frac{\Delta_4 (P^M M)_t}{(P^M M)_{t-4}} = \alpha_6 + \beta_6^1 \frac{\Delta_4 (P^M M)_{t-1}}{(P^M M)_{t-5}} + \beta_6^2 \frac{\Delta_4 (P^M M)_{t-4}}{(P^M M)_{t-8}} + \beta_6^3 \frac{\Delta_4 (P^{DD} DD)_t}{(P^{DD} DD)_{t-4}} + \beta_6^4 \frac{\Delta_4 ER_t^{\varepsilon/\$}}{ER_{t-4}^{\varepsilon/\$}} + \varepsilon_6 \qquad (9)$$

$$\frac{\Delta_4 P_t^M}{P_{t-4}^M} = \alpha_7 + \beta_7^1 \frac{\Delta_4 P_{t-1}^M}{P_{t-5}^M} + \beta_7^2 \frac{\Delta_4 P_{t-2}^M}{P_{t-6}^M} + \beta_7^3 \frac{\Delta_4 P_t^{Oil}}{P_{t-4}^{Oil}} + \beta_7^4 \frac{\Delta_4 P_{t-1}^{Oil}}{P_{t-5}^{Oil}} + \beta_7^5 \frac{\Delta_4 ER_t^{\varepsilon/\$}}{ER_{t-4}^{\varepsilon/\$}} + \beta_7^6 \frac{\Delta_4 ER_{t-1}^{\varepsilon/\$}}{ER_{t-5}^{\varepsilon/\$}} + \beta_7^7 \frac{\Delta_4 P_t^{Metals}}{P_{t-4}^{Metals}} + \varepsilon_7 \qquad (10)$$

$$\Delta M_t = \alpha_8 + \beta_8^1 \Delta M_{t-1} + \beta_8^2 \Delta Y_t + \beta_8^3 \Delta Y_{t-1} + seas + \varepsilon_8 \qquad (11),$$

where the variable descriptions are as explained above, while *seas* represents the included seasonal dummies. The sub-indices of the variables represent the time period (at a quarterly frequency), while the coefficients are numbered following a convention according to which the subscript denotes the equation and the superscript denotes the consecutive order of the explanatory variable within the equation. The econometric results from the export and import analysis are presented in **Appendixes 2 and 3** and are discussed together with the forecasting performance below.

## 4. Forecasting Performance of the Equations

We present in this part only the direct forecasting properties of the equations presented above (4)–(11), while the interrelations between the dependent variables are disregarded. In our view, the direct link between the equations might be used at a later stage for producing a direct and an indirect forecast for the variable of primary interest. For example, if we are primarily interested in the nominal foreign trade development, we could forecast it directly (via equations (5) and (9)) or forecast the real and price developments and then calculate from these the nominal forecast, i.e. forecast it indirectly.

In the forecasting exercise, we use and compare the two main methods, one-period ahead (static) and multi-period (dynamic) projections. The forecasting properties of the equations are tested with in-sample and out-of-sample projections over the one year horizon. For the latter, the equations are

initially re-estimated over a sub-sample and then the forecasts are produced one year forward from the restricted sample. Finally, dynamic and static forecasts are produced over the period 2000q1:2008q2. It should be kept in mind that the dynamic multi-period method uses the projected value of the dependent variable for the previous period, calculated at the preceding iteration, for forecasting the value of the current period. In this way, forecasts for a period longer than several quarters ahead might diverge significantly from the actual values of the variable and increase the forecasting error. On the other hand, the static (one-period ahead) forecast might be more accurate over longer time horizons (in-sample), but in real-life the method produces only one-period ahead, out-of-sample forecast. For a comparison of the two approaches, we present three measures of the deviation between the forecasts and the actual values, namely the root mean squared error (RMSE), the mean absolute error (MAE) and the mean absolute percent error (MAPE).

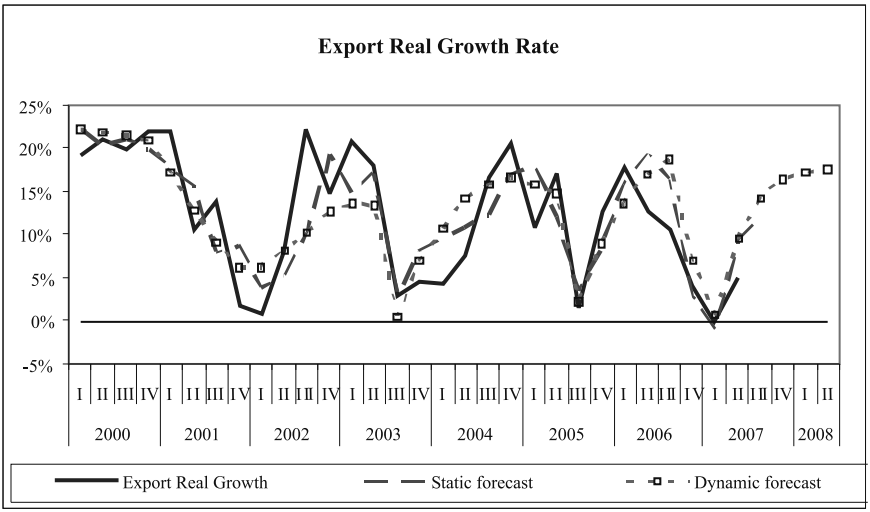
### *4.1. Export Flows Estimation and Forecasting*

*Real Growth Rate of Exports*

Following the procedure described above, we arrive at a reduced-form of the model (equation 4 and Appendix 2) explaining the real growth rate of the exports of goods. The export real growth rate exhibits an auto-regressive structure of order one (there is some inertia in the process) and it depends positively on the weighted demand of the trading partners (measured by their real growth of imports). A dummy variable corrects for three episodes with actual export growth much lower than the predicted one, which in our view is due to large and uncaptured by the model one-off factors. These episodes are primarily identified on statistical grounds, i.e. the residuals of the equation have extreme values in these sample points implying that the observations in these episodes might be regarded as outliers from an econometric point of view. However, one may relate the export underperformance in two of these episodes to particular events that took place at that time, namely there were floods in the summer of 2005 that destroyed much of the harvest in that year (hence the agricultural exports were low in that period), while the joining of the EU in 2007 was associated with a methodological change in the data collection scheme (introduction of the Intrastat system) which might have led to initial underreporting of exports.

**Chart 1** below presents the actual real export growth rates and the dynamic and static forecasts over the period 2000–2008. The forecasts are produced with coefficients, estimated over the whole sample. **Table 1** presents the comparison between the two forecasting methods over different time horizons for this specification.

Chart 1




As expected, the static forecast performs better over the longer horizon, although marginally. On the other hand, the dynamic forecast has lower MAPE in the one-year ahead projection both in- and out-of-sample, at least for the last four quarters of the sample.

Table 1

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 0.036 | 0.029 | 53.0% |
| | | out-of-sample | 2006q3:2007q2 | 0.039 | 0.032 | 186.8% |
| | | whole period | 2000q3:2008q2 | 0.045 | 0.038 | 85.6% |
| | Static | in-sample | 2006q3:2007q2 | 0.035 | 0.030 | 202.6% |
| | | out-of-sample | 2006q3:2007q2 | 0.041 | 0.036 | 328.0% |
| | | whole period | 2000q3:2008q2 | 0.046 | 0.039 | 83.3% |

*Nominal Growth Rate of Exports*

The specification for the nominal export growth rate is similar to the one for the physical volumes. The nominal growth has a positive autocorrelation of first order and it depends on the external demand and the exchange rate euro/US dollar from the previous period. The absence of a significant constant in the growth equation is interpreted as a lack of statistically significant linear trend in the corresponding export data in levels.

The direct forecasts of the nominal export growth are presented in **Chart 2** and **Table 2** below. Contrary to the real growth rates forecast, the static projections for the nominal growth outperform the dynamic ones in all horizons.

Chart 2

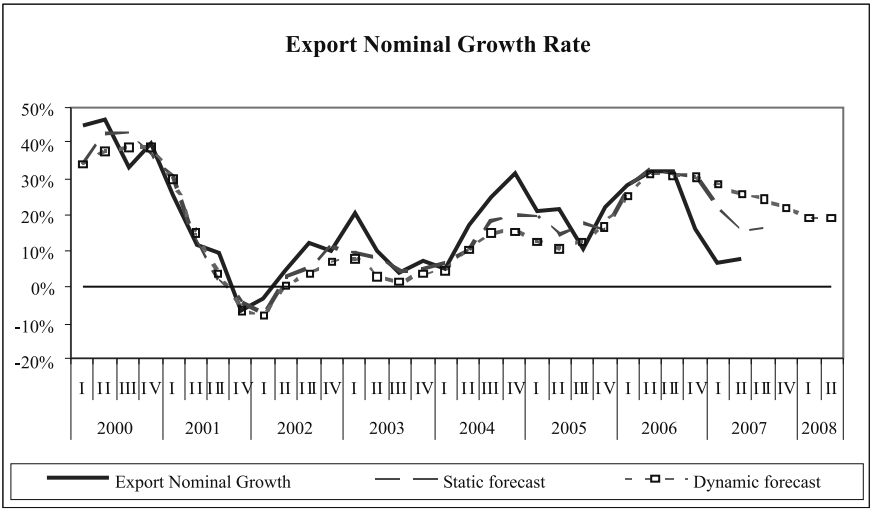



Table 2

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 0.158 | 0.138 | 158.9% |
| | | out-of-sample | 2006q3:2007q2 | 0.209 | 0.184 | 210.6% |
| | | whole period | 2000q3:2008q2 | 0.087 | 0.068 | 56.1% |
| | Static | in-sample | 2006q3:2007q2 | 0.113 | 0.097 | 103.5% |
| | | out-of-sample | 2006q3:2007q2 | 0.145 | 0.127 | 136.2% |
| | | whole period | 2000q3:2008q2 | 0.068 | 0.053 | 42.5% |

*Export Deflator*

The export deflator depends on a set of international prices, and from the initial more general specification only the crude oil and metals prices are retained based on statistical significance. The export deflator depends also on the nominal exchange rate behavior and exhibits inertia (AR1) and base effects (significant fourth lag). The autoregressive structure is consistent with the behavior of the nominal and real growth rates of export.

The one- and multi-period ahead forecasts, presented at **Chart 3** and **Table 3**, are fairly close to each other due to the relatively high explanatory power of the model. Nevertheless, the formal tests reveal slightly better static method for the out-of-sample projection, while the opposite is true for the in-sample exercise.

Chart 3

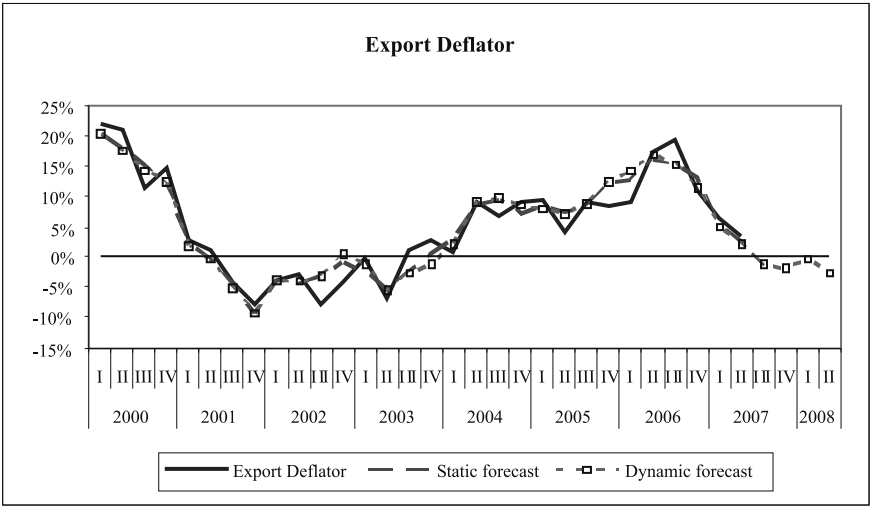



Table 3

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 0.021 | 0.016 | 18.2% |
| | | out-of-sample | 2006q3:2007q2 | 0.036 | 0.033 | 43.2% |
| | | whole period | 2000q3:2008q2 | 0.025 | 0.020 | 88.2% |
| | Static | in-sample | 2006q3:2007q2 | 0.022 | 0.019 | 20.0% |
| | | out-of-sample | 2006q3:2007q2 | 0.033 | 0.026 | 33.3% |
| | | whole period | 2000q3:2008q2 | 0.025 | 0.021 | 123.2% |

*External Import Demand*

The forecasting of the weighted import growth of the trade partners of Bulgaria is necessary as an auxiliary regression due to the unavailability of such forecasts from external sources, whereas GDP forecasts are normally available as an external assumption. The final reduced-form specification includes autocorrelation and base effects in the import dynamics of the partners as well as positive dependence on the trade-weighted GDP growth rates. The produced with the estimated relation forecasts (static and dynamic) are presented in **Chart 4** and **Table 4** below.

Chart 4

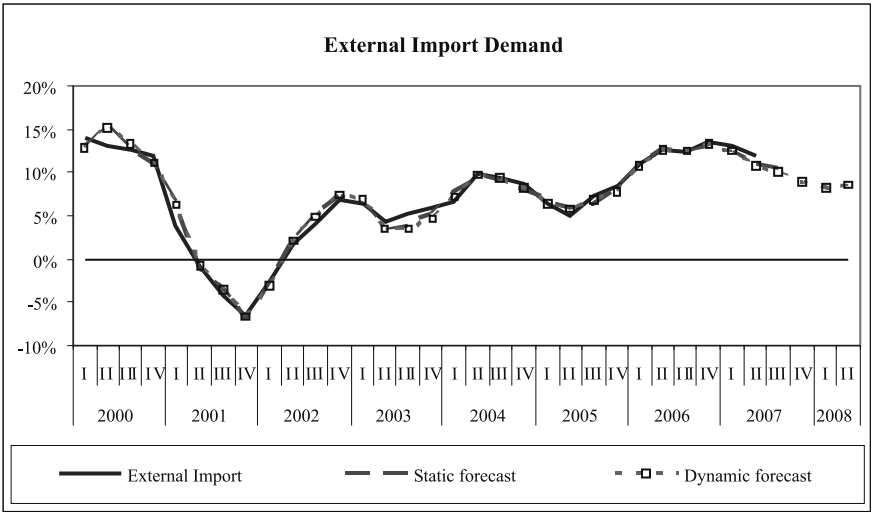



Table 4

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 0.007 | 0.005 | 4.2% |
| | | out-of-sample | 2006q3:2007q2 | 0.009 | 0.008 | 6.5% |
| | | whole period | 2000q3:2008q2 | 0.009 | 0.007 | 11.6% |
| | Static | in-sample | 2006q3:2007q2 | 0.005 | 0.004 | 3.5% |
| | | out-of-sample | 2006q3:2007q2 | 0.007 | 0.007 | 5.3% |
| | | whole period | 2000q3:2008q2 | 0.009 | 0.007 | 11.7% |

## *4.2. Import Flows Estimation and Forecasting*

*Imports of Goods in Real Terms*

For the forecasting of the real import developments several alternative approaches were tested, including the two presented in this paper, which are forecasting the import flow at constant prices with a subsequent calculation of the growth rates and forecasting directly the real import growth rates.

The results from the first of these approaches (equation 11), i.e. modeling the first differences of the real variables, are presented in **Appendix 3**. The differencing of the variables was required due to the non-stationarity of the processes. The presence of a significant seasonality is accounted for by the inclusion of a full set of seasonal dummies (irrespective of their significance). In addition to the autoregressive structure of imports it depends also on GDP dynamics. The forecasts of the model are presented in **Chart 5** and **Table 5**

below. The high explanatory power of the model results in small forecast errors, expressed as a per cent of the dependent variable, and more accurate static method in all horizons and samples.

**Chart 5**

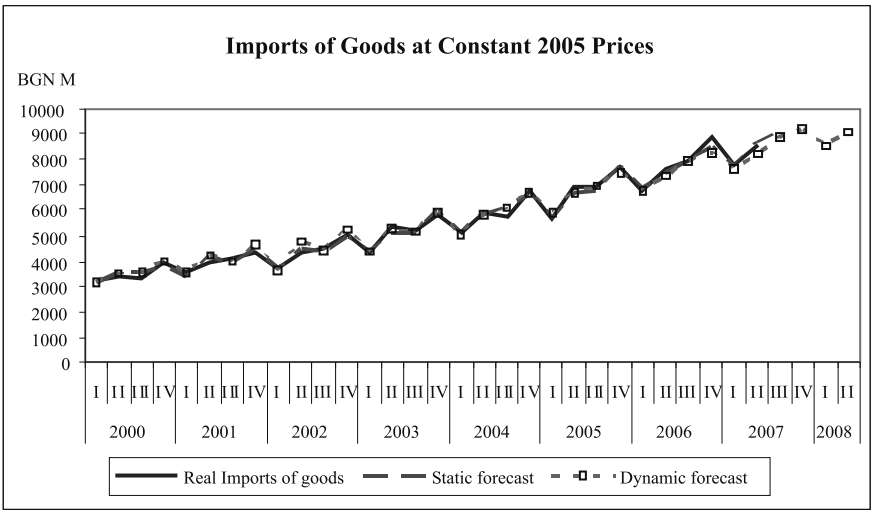



**Table 5**

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 229.3 | 185.4 | 2.2% |
| | | out-of-sample | 2006q3:2007q2 | 277.8 | 217.7 | 2.5% |
| | | whole period | 2000q3:2008q2 | 212.0 | 161.7 | 3.1% |
| | Static | in-sample | 2006q3:2007q2 | 213.2 | 151.1 | 1.7% |
| | | out-of-sample | 2006q3:2007q2 | 263.5 | 188.3 | 2.2% |
| | | whole period | 2000q3:2008q2 | 174.7 | 141.5 | 2.8% |

The second approach, based on the direct forecasting of the real import growth rate, produced a significant dependence on the domestic demand developments, as well as first-order autocorrelation. Two periods are identified, where the dependent variable exhibits unsystematic and significant deviation from its predicted value, which are corrected by the inclusion of impact dummy variables (having the value of '1' for one or two quarters and zero otherwise). The forecasting performance of the model is illustrated in **Chart 6** and **Table 6**. For this specification the static projection performs better in the one-year ahead horizon while the dynamic forecast is marginally better over the whole sample.

Chart 6

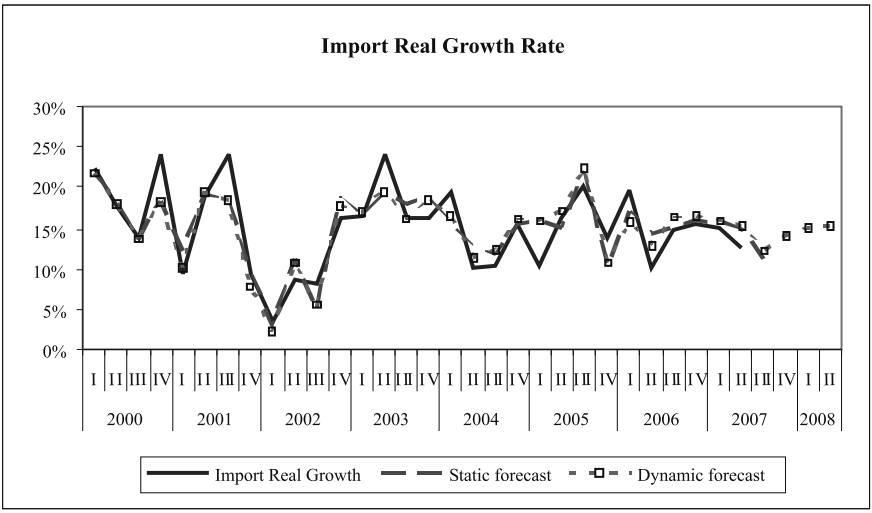



Table 6

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 0.014 | 0.011 | 8.2% |
| | | out-of-sample | 2006q3:2007q2 | 0.019 | 0.017 | 12.1% |
| | | whole period | 2000q3:2008q2 | 0.027 | 0.020 | 14.9% |
| | Static | in-sample | 2006q3:2007q2 | 0.012 | 0.009 | 7.0% |
| | | out-of-sample | 2006q3:2007q2 | 0.016 | 0.013 | 9.9% |
| | | whole period | 2000q3:2008q2 | 0.028 | 0.022 | 16.0% |

*Nominal Growth of Imports*

The reduced-form specification for the nominal development of imports includes the first and the fourth lag of the dependent variable, the nominal growth rate of domestic demand, as well as the exchange rate EUR/USD. The experiments with different specifications revealed a worse explanatory power for the nominal GDP growth as compared to domestic demand. The significant effect of exchange rate developments, which was revealed for exports is also related to the share of foreign trade invoiced in USD (mostly commodities and energy resources). The interpretation of the coefficient is the following: nominal depreciation of the BGN (EUR) against the USD (an increase of the exchange rate index) is associated with larger nominal value of imports due to the low price elasticity of the USD-invoiced imported goods (energy resources). Hence, even when the quantity of imported goods declines due to

the higher imported prices (in domestic currency), the price effect dominates in the nominal amount and the overall effect is positive.

**Chart 7** and **Table 7** below present the forecasts for the nominal import growth. For this specification the dynamic forecast performs relatively well in the one-year ahead horizon.

Chart 7

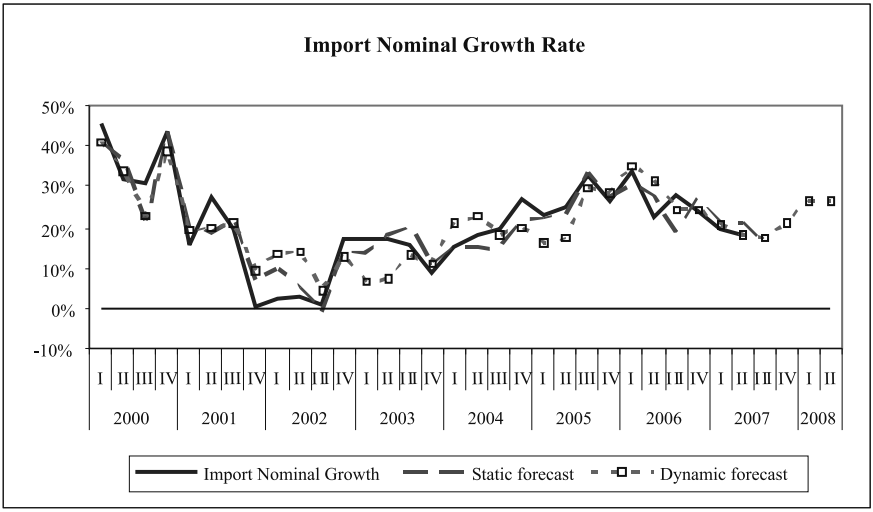



Table 7

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 0.052 | 0.039 | 16.0% |
| | | out-of-sample | 2006q3:2007q2 | 0.053 | 0.038 | 15.9% |
| | | whole period | 2000q3:2008q2 | 0.060 | 0.050 | 200.0% |
| | Static | in-sample | 2006q3:2007q2 | 0.054 | 0.044 | 18.4% |
| | | out-of-sample | 2006q3:2007q2 | 0.055 | 0.044 | 18.4% |
| | | whole period | 2000q3:2008q2 | 0.044 | 0.036 | 128.6% |

*Import Deflator*

Following the same general-to-specific approach described above the derived specification for the import deflator includes an autoregressive structure, international prices of crude oil and metals and the EUR/USD nominal exchange rate. The effect of the exchange rate in the price equation is in line with the interpretation given above for the nominal import development, namely, that the price component dominates the real effect. The autoregressive structure of the import deflator reveals higher inertia than the corresponding export deflator behaviour.

The forecasts, presented in **Chart 8** and **Table 8** below, reveal relatively good properties of the dynamic projection, although in the out-of-sample exercise the static forecast clearly dominates.

Chart 8

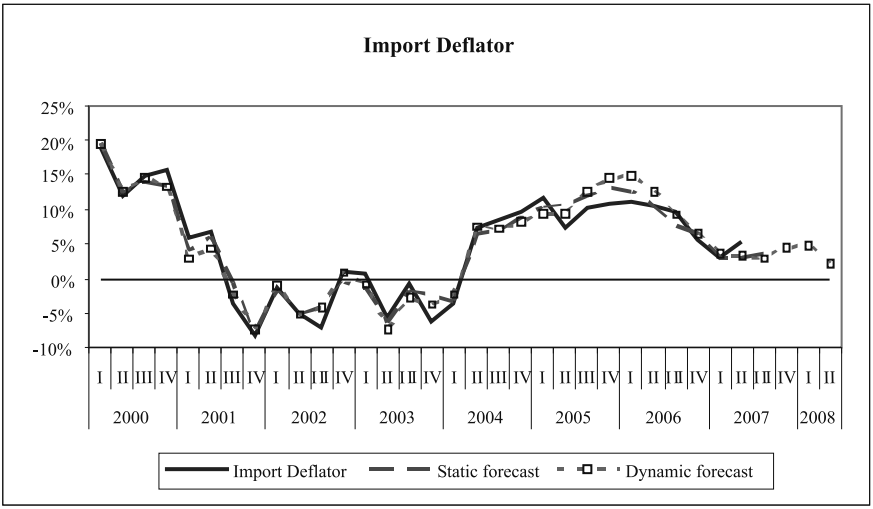



Table 8

| Variable | Forecasting Method | Sample | Forecasting Horizon | RMSE | MAE | MAPE |
|---|---|---|---|---|---|---|
| Export_r_g | Dynamic | in-sample | 2006q3:2007q2 | 0.015 | 0.010 | 16.8% |
| | | out-of-sample | 2006q3:2007q2 | 0.028 | 0.027 | 49.5% |
| | | whole period | 2000q3:2008q2 | 0.018 | 0.015 | 36.6% |
| | Static | in-sample | 2006q3:2007q2 | 0.016 | 0.013 | 20.8% |
| | | out-of-sample | 2006q3:2007q2 | 0.021 | 0.017 | 28.0% |
| | | whole period | 2000q3:2008q2 | 0.017 | 0.013 | 36.5% |

### *4.3. Insignificance of the Real Effective Exchange Rate*

In spite of its theoretical importance, the different series for the real effective exchange rate (REER) of the BGN do not appear to be significant in the estimations we performed, neither for the export, nor for the import flows. We could not find a significant explanatory power not only for the CPI-deflated REER, but also for the ULC-based index.

Explanations for this result probably relate to the specifics of the transition and restructuring period in Bulgaria, as well as to the current converging path of the economy. On the one hand, productivity catching up naturally causes a trend of appreciation of the REER. On the other hand, deepening integration within the EU market influences foreign trade developments. Such structural but unaccounted factors probably break the statistical relation between REER developments and export and import flows of the country.

*Conclusion*

One of the main conclusions of the author is that with the available data for the Bulgarian economy and the chosen modeling approach only short run export and import forecasts could be produced. Although accurate (particularly for some of the specifications), the forecasts are reliable for only several quarters ahead. Therefore, we regard the developed model as an auxiliary instrument to a full-fledged macroeconomic projections model, which might be used for comparing and checking the results from the main tool.

In our view, there are a number of ways for extending and improving the forecasting methods and results, presented in this paper. First, the relations should be re-estimated as the sample size increases with time, and therefore additionally checked for robustness. The short sample size of the available data for Bulgaria reduces the applicability of a number of econometric techniques, which are based on asymptotic results and thus appropriate for large samples. Second, the obvious alternative to the classical statistical methods is the Bayesian approach to parameter estimation, which might result in better forecasting performance of the equations. The Bayesian method also allows the incorporation of additional information in the form of expert judgment on prior probabilities.

Finally, there are a number of alternative approaches for developing forecasting instruments in the field of foreign trade. One way to go is to give up the econometric estimation approach completely and to develop a macro model with calibrated relations. Such a model could follow the neo-classical or new keynesian tradition and could produce model-based forecasts, although not being informed by actual data.

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## UNIT ROOTS TESTS FOR THE KEY VARIABLES

| Variables | Description | Period | ADF | | | | | KPSS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Levels | | 1 difference | | Order of | levels | 1 difference | critical values | | | Order of |
| | | | t-statistic | p-value' | t-statistic | p-value' | integration | t-statistic | t-statistic | 1% | 5% | 10% | integration |
| DD_4d | Annual nominal growth rate of domestic demand | 1998:Q1-2007:Q2 | -114.028 | 0.000 | | | I(0) | 0.324360 | | 0.739 | 0.463 | 0.347 | I(0) |
| DD_rg | Annual real growth rate of domestic demand | 1998:Q1-2007:Q2 | -6.521 | 0.000 | | | I(0) | 0.249816 | | 0.739 | 0.463 | 0.347 | I(0) |
| Exp_defl | Goods export deflator | 1999:Q1-2007:Q2 | -1.978 | 0.047 | | | I(0) | 0.170212 | | 0.739 | 0.463 | 0.347 | I(0) |
| Exp_ng | Annual nominal growth rate of exports | 1998:Q1-2007:Q2 | -3.277 | 0.024 | | | I(0) | 0.182604 | | 0.739 | 0.463 | 0.347 | I(0) |
| Exp_r_g | Annual real growth rate of exports | 1999:Q1-2007:Q2 | -3.898 | 0.005 | | | I(0) | 0.146246 | | 0.739 | 0.463 | 0.347 | I(0) |
| Export | Exports of goods, mln euro | 1998:Q1-2007:Q2 | -2.061 | 0.550 | -3.627* | 0.0437 | I(1) or I(2) | 0.696541 | 0.402025 | 0.739 | 0.463 | 0.347 | I(1) or I(2) |
| Ext_gdp | Composite measure of external demand in terms of real GDP growth of our trade partners | 1999:Q1-2007:Q2 | -2.689 | 0.087 | | | I(0) | 0.215423 | | 0.739 | 0.463 | 0.347 | I(0) |
| Ext_imp | Composite measure of external demand in terms of the real import growth of our trade partners | 1999:Q1-2007:Q2 | -2.636 | 0.097 | | | I(0) | 0.196137 | | 0.739 | 0.463 | 0.347 | I(0) |
| Imp_defl | Goods import deflator | 1999:Q1-2007:Q2 | -1.992 | 0.046 | | | I(0) | 0.126200 | | 0.739 | 0.463 | 0.347 | I(0) |
| Imp_n_g | Annual nominal growth rate of imports | 1998:Q1-2007:Q2 | -3.854 | 0.005 | | | I(0) | 0.128274 | | 0.739 | 0.463 | 0.347 | I(0) |
| Imp_r_g | Annual real growth rate of imports | 1999:Q1-2007:Q2 | -4.800 | 0.001 | | | I(0) | 0.055558 | | 0.739 | 0.463 | 0.347 | I(0) |
| Import | Imports of goods, mln euro | 1998:Q1-2007:Q2 | 0.818 | 1.000 | -2.6564* | 0.2598 | I(2) | 0.703179 | 0.384153 | 0.739 | 0.463 | 0.347 | I(1) or I(2) |
| Metals | Metal Prices Annual Change | 1998:Q1-2007:Q2 | -3.215* | 0.098 | | | I(0) | 0.096741* | | 0.216 | 0.146 | 0.119 | I(0) |
| Oil | Petroleum spot price, annual change | 1998:Q1-2007:Q2 | -4.756 | 0.001 | | | I(0) | 0.073895 | | 0.739 | 0.463 | 0.347 | I(0) |
| REER_ULC | Real Effective Exchange Rate, ULC-deflated | 1998:Q1-2007:Q2 | -3.242 | 0.002 | | | I(0) | 0.305834 | | 0.739 | 0.463 | 0.347 | I(0) |
| RGDP | GDP at constant prices | 1998:Q1-2007:Q2 | -0.762 | 0.959 | -5.7911* | 0.0003 | I(1) or I(2) | 0.818478 | 0.198245 | 0.739 | 0.463 | 0.347 | I(1) |
| RimpG | Imports at constant prices | 1998:Q1-2007:Q2 | -0.218 | 0.990 | -2.875546 | 0.0594 | I(1) or I(2) | 0.713898 | 0.148658 | 0.739 | 0.463 | 0.347 | I(1) |
| USD | Annual change of the BGN/USD rate | 1998:Q1-2007:Q2 | -1.883 | 0.058 | | | I(0) | 0.344615 | | 0.739 | 0.463 | 0.347 | I(0) |

**Notes:** IMF or ECB forecasts are used for the variables Ext_gdp, Ext_imp, USD, Oil, Metals. ADF stands for Augmented Dickey Fuller and KPSS for Kwiatkowski-Phillips-Schmidt-Shin tests. The tests are performed with a constant and without a trend term in the test regression (with the exception of the variables Exp_defl, Imp_defl, REER_ULC, USD for which both are excluded).

* includes trend and a constant in the test regression

' MacKinnon (1996) one-sided p-values

Appendix 2

## EXPORT EQUATIONS

Dependent Variable: EXP_R_G
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 1999Q2 2007Q2
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.040877 | 0.019213 | 2.127633 | 0.0420 |
| EXP_R_G(-1) | 0.541677 | 0.094915 | 5.706966 | 0.0000 |
| EXT_IMP | 0.437828 | 0.190650 | 2.296501 | 0.0291 |
| D033_053_064_071 | -0.130086 | 0.030304 | -4.292649 | 0.0002 |

| | | | |
|---|---|---|---|
| R-squared | 0.636535 | Mean dependent var | 0.113668 |
| Adjusted R-squared | 0.598935 | S.D. dependent var | 0.088038 |
| S.E. of regression | 0.055754 | Akaike info criterion | -2.822510 |
| Sum squared resid | 0.090148 | Schwarz criterion | -2.641115 |
| Log likelihood | 50.57142 | F-statistic | 16.92922 |
| Durbin-Watson stat | 2.226063 | Prob (F-statistic) | 0.000002 |

Dependent Variable: EXP_N_G
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 1999Q2 2007Q2
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXP_N_G(-1) | 0.463544 | 0.088064 | 5.263744 | 0.0000 |
| EXT_IMP | 1.310235 | 0.220426 | 5.944092 | 0.0000 |
| USD(-1) | 0.351344 | 0.131744 | 2.666857 | 0.0122 |

| | | | |
|---|---|---|---|
| R-squared | 0.753924 | Mean dependent var | 0.174315 |
| Adjusted R-squared | 0.737519 | S.D. dependent var | 0.140625 |
| S.E. of regression | 0.072046 | Akaike info criterion | -2.336509 |
| Sum squared resid | 0.155720 | Schwarz criterion | -2.200463 |
| Log likelihood | 41.55240 | Durbin-Watson stat | 1.568140 |

Dependent Variable: EXP_DEFL
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 2000Q1 2007Q2
Included observations: 30 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXP_DEFL(-1) | 0.265920 | 0.093261 | 2.851343 | 0.0086 |
| EXP_DEFL(-4) | -0.140846 | 0.072577 | -1.940636 | 0.0637 |
| OIL 0.070373 | 0.017758 | 3.962765 | 0.0005 | |
| METALS0.186749 | 0.030810 | 6.061408 | 0.0000 | |
| USD 0.365795 | 0.063860 | 5.728078 | 0.0000 | |

| | | | |
|---|---|---|---|
| R-squared | 0.910898 | Mean dependent var | 0.053622 |
| Adjusted R-squared | 0.896642 | S.D. dependent var | 0.083732 |
| S.E. of regression | 0.026919 | Akaike info criterion | -4.240933 |
| Sum squared resid | 0.018116 | Schwarz criterion | -4.007400 |
| Log likelihood | 68.61399 | Durbin-Watson stat | 2.229111 |

Dependent Variable: EXT_IMP
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 2000Q1 2007Q2
Included observations: 30 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C -0.034454 | 0.006111 | -5.638466 | 0.0000 | |
| EXT_IMP(-1) | 0.338866 | 0.065665 | 5.160522 | 0.0000 |
| EXT_IMP(-4) | -0.158596 | 0.038847 | -4.082624 | 0.0004 |
| EXT_GDP3.300480 | 0.296698 | 11.12403 | 0.0000 | |

| | | | |
|---|---|---|---|
| R-squared | 0.972685 | Mean dependent var | 0.069848 |
| Adjusted R-squared | 0.969534 | S.D. dependent var | 0.054885 |
| S.E. of regression | 0.009580 | Akaike info criterion | -6.334728 |
| Sum squared resid | 0.002386 | Schwarz criterion | -6.147901 |
| Log likelihood | 99.02091 | F-statistic | 308.6235 |
| Durbin-Watson stat | 2.275812 | Prob (F-statistic) | 0.000000 |

Appendix 3

## IMPORT EQUATIONS

Dependent Variable: IMP_R_G
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 1999Q2 2007Q2
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C 0.102384 | 0.021070 | 4.859129 | 0.0000 | |
| IMP_R_G(-1) | 0.367427 | 0.090362 | 4.066187 | 0.0004 |
| DD_RG0.970643 | 0.190455 | 5.096451 | 0.0000 | |
| DD_RG(-1)-1.039880 | 0.189352 | -5.491781 | 0.0000 | |
| D994 0.174015 | 0.032397 | 5.371313 | 0.0000 | |
| D014_021-0.083656 | 0.022209 | -3.766737 | 0.0008 | |

| | | | |
|---|---|---|---|
| R-squared | 0.746971 | Mean dependent var | 0.150893 |
| Adjusted R-squared | 0.700114 | S.D. dependent var | 0.055094 |
| S.E. of regression | 0.030170 | Akaike info criterion | -4.000940 |
| Sum squared resid | 0.024577 | Schwarz criterion | -3.728848 |
| Log likelihood | 72.01551 | F-statistic | 15.94141 |
| Durbin-Watson stat | 2.563843 | Prob (F-statistic) | 0.000000 |

Dependent Variable: IMP_N_G
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 1999Q1 2007Q2
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| IMP_N_G(-1) | 0.559248 | 0.070349 | 7.949621 | 0.0000 |
| IMP_N_G(-4) | -0.424518 | 0.062823 | -6.757386 | 0.0000 |
| DD_4D1.295746 | 0.134101 | 9.662447 | 0.0000 | |
| USD 0.159297 | 0.088617 | 1.797600 | 0.0827 | |
| D004 0.193140 | 0.050907 | 3.793962 | 0.0007 | |

| | | | |
|---|---|---|---|
| R-squared | 0.855247 | Mean dependent var | 0.204172 |
| Adjusted R-squared | 0.835281 | S.D. dependent var | 0.114279 |
| S.E. of regression | 0.046381 | Akaike info criterion | -3.168808 |
| Sum squared resid | 0.062384 | Schwarz criterion | -2.944344 |
| Log likelihood | 58.86974 | Durbin-Watson stat | 2.197973 |

Dependent Variable: IMP_DEFL
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 2000Q1 2007Q2
Included observations: 30 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| IMP_DEFL(-1) | 0.481221 | 0.105831 | 4.547068 | 0.0001 |
| IMP_DEFL(-2) | 0.129433 | 0.067596 | 1.914807 | 0.0680 |
| OIL 0.159182 | 0.023005 | 6.919383 | 0.0000 | |
| OIL(-1)-0.085098 | 0.025487 | -3.338830 | 0.0029 | |
| USD 0.486693 | 0.071882 | 6.770756 | 0.0000 | |
| USD(-1)-0.301364 | 0.078001 | -3.863594 | 0.0008 | |
| METALS0.058532 | 0.021028 | 2.783490 | 0.0106 | |

| | | | |
|---|---|---|---|
| R-squared | 0.948627 | Mean dependent var | 0.048447 |
| Adjusted R-squared | 0.935226 | S.D. dependent var | 0.074470 |
| S.E. of regression | 0.018953 | Akaike info criterion | -4.892716 |
| Sum squared resid | 0.008262 | Schwarz criterion | -4.565770 |
| Log likelihood | 80.39073 | Durbin-Watson stat | 1.561010 |

Dependent Variable: D(RIMPG)
Method: Least Squares
Date: 11/01/07 Time: 10:38
Sample (adjusted): 1998Q3 2007Q2
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(RIMPG(-1)) | -0.762540 | 0.118807 | -6.418281 | 0.0000 |
| D(RGDP)0.551893 | 0.119640 | 4.612951 | 0.0001 | |
| D(RGDP(-1)) | 0.736279 | 0.142466 | 5.168090 | 0.0000 |
| @SEAS(1)1006.093 | 236.3708 | 4.256419 | 0.0002 | |
| @SEAS(2)1118.387 | 226.9118 | 4.928731 | 0.0000 | |
| @SEAS(3)-918.3313 | 255.0416 | -3.600711 | 0.0012 | |
| @SEAS(4)-579.6580 | 248.7004 | -2.330748 | 0.0272 | |
| D021 -571.2839 | 214.3365 | -2.665359 | 0.0126 | |

| | | | |
|---|---|---|---|
| R-squared | 0.919376 | Mean dependent var | 164.1231 |
| Adjusted R-squared | 0.899221 | S.D. dependent var | 611.4562 |
| S.E. of regression | 194.1115 | Akaike info criterion | 13.56787 |
| Sum squared resid | 1055019. | Schwarz criterion | 13.91977 |
| Log likelihood | -236.2217 | Durbin-Watson stat | 2.306140 |

DP/79/2009

# The Great Depression in the Eyes of Bulgaria's Inter-war Economists
## (How History of Economic Thought Could Matter for Today's Policy Advice)

Stefan Kolev

**Abstract.** The current paper is an attempt to reconstruct the economic policy debates in Bulgaria around the Great Depression in the 1930s. The goal is twofold. Firstly, it is of interest to track down the development of Bulgarian economic thought in the inter-war period and to analyse its intellectual relationships to the evolution of European (especially German-language) political economy. Secondly, due to some significant analogies between the situation in the surveyed period and the current crisis, it seems possible to tentatively draw conclusions from the economists' debates then as a contribution to crisis management and post-crisis development of Bulgaria today. The paper is only secondarily interested in the quantitative economic history of the 1930s; instead, the primary objective is to show that history of economic thought as a discipline can give qualitative indications how past theoretical discourse can be inspiring both for conducting economic policy and for avoiding past mistakes.

**Резюме.** Настоящото изследване представлява опит за реконструиране на дебатите по икономическата политика на България в годините около Голямата депресия през 30-те години на XX век. Целта му е двояка. Първо, то представлява интерес с цел проследяване на развитието на българската икономика в периода между двете световни войни и като анализ на интелектуалните ѝ взаимодействия с развитието на европейската (по-специално с германоезичната) политическа икономия. Второ, поради някои съществени сходства със ситуацията през разглеждания период и сегашната криза изглежда възможно да се направят ориентировъчни изводи от тогавашната икономическа дискусия като принос за управлението и следкризисното развитие на България днес. Като втора цел се проучва количествено икономическата история от 30-те години на XX век, вместо първата му цел – да покаже, че като научна дисциплина икономическата мисъл може да даде качествени признаци за това как теоретичният дискурс в миналото може да вдъхнови както провеждането на икономическата политика, така и избягването на грешките от миналото.

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# Contents

## 1. Introduction

The Great Depression, beginning in late 1929 and persisting well into the 1930s, has always been a focal point for researchers interested both in economic history and in history of economic thought. Not only was this period a time-span of major economic, political and social distress. What might be perceived as equally important is the fact that at that moment economics as a branch of social science faced substantial changes, partially due to the severe criticism which was addressed to it from the public. According to public opinion, it had failed in preventing the Depression and thus was largely perceived, just as during the 19th century, as the dismal science which is of no real use for the progress of society.[1]

Crises are, however, often a culmination and a new beginning at the same time.[2] This is true for economic, as well as for intellectual crises, and the Great Depression was certainly both. At a time of severe disturbances, social sciences and economics in particular have achieved substantial innovations in their development. Adam Smith and the beginning of the Industrial Revolution, David Ricardo and the Napoleonic wars or Karl Marx and the bourgeois revolutions of 1848 are good examples supporting this hypothesis. The time of the Great Depression and its aftermath constitute also such a time. The coming up of Keynesian macro-economics is probably the most lasting remainder of these "years of high theory", as they are called.

But this is by far not all. The debates around this "great crisis of capitalism" are not only interesting in a purely scientific respect, but also as a prominent example for (some) economists being willing to exit the ivory tower of academia and generate policy advice, both for politicians and the general public. Such discussions in the Western countries have been well studied by historians of economic thought.[3] Countries like Bulgaria, however, which do not have a long tradition in economic reasoning and are besides small economies, have up to now not been in the center of interest. The current paper attempts to fill a part of this gap.

Bulgarian economists in the inter-war period are generally not perceived as being a part of a genuinely own tradition in economics, unlike *e.g.* their

[1] For an analysis of the deficiencies and "intransparency" of the German-language debate see *Hagemann, H.* (2009).
[2] See *Неновски, Н.* (2007), p. 13.
[3] For the exposure of Austrian economists in popular newspapers in Vienna during the Depression see *Klausinger, H.* (2005).

Polish or Hungarian colleagues of that time.[4] This leads to the common reproach in the few Bulgarian publications covering their work that they are "epigones" of foreign intellectual developments.[5] The current article cannot deal with this accusation in detail since it would require a profound comparative analysis of the significant volume of economic publications in the time until 1944. What will, however, be an important thesis in the paper is that the (semi)academic discussions in the three selected journals of that period do not substantially differ in quality and sophistication from the debates in the Western world. Of course, the influence of the Youngest German Historical School, of Marxist economics or (to a smaller extent) of the Austrian School of Economics can be tracked down and is an important feature of the discourse among Bulgarian economists. This, however, according to the author is less than a sign of being "epigones" of foreign thinkers. Instead, this fact can be interpreted as a laudable willingness of Bulgarians to be in line with the Western debates about which they are obviously well informed. The reproach of "provincialism" is thus turned to the opposite: the economic community in Bulgaria at that time was at least as open and probably more in line with the Western discourse than it seems to be the case today.[6]

The structure of the paper is to be briefly outlined here. The exposition will begin with some brief stylized facts about the situation in Bulgaria during the late 1920s and early 1930s, showing what the major symptoms of the Depression were in the specific Bulgarian context. In a next step, some initial analogies from this economic-historical setting will be drawn with respect to the comparability of the country situation then and now. Then the core of the paper will begin with its two layers. First, the general economic policy debate will be presented, a debate more focused on the *structural long-term* aspects of economic policy and the role of government in them. In a second step, the *anti-cyclical short-term* proposals will be analyzed. One of the major theses of the paper will be that although a separability of the two layers seems desirable, it is often difficult to attain since the Bulgarian economists in their majority see the cyclical phenomena as densely intertwined with the overall structural problems of the economy.

A brief remark on the methodology of the study might be in place now. In the relatively short period of the stay at the BNB the author was able to analyze three of the major economic periodicals in Bulgaria at the time

[4] For an interesting contribution on the early Bulgarian tradition in History of Economic Thought see *Юрданов, Ю.* (1935).

[5] See *Аврамов, Р.* (2007), pp. 348–392.

[6] A prominent example for this "openness"-hypothesis are the extensive publications of Prof. Dr. Georgi Swrakoff in the 1930s and 1940s in first-rate German economic journals where he is a welcome reviewer of major Western thinkers, e.g. of a pioneering book of the founding father of German ordoliberalism, Walter Eucken, see *i.a. Swrakoff, G.* (1939).

of the Depression. These are *Списание на Българското Икономическо Дружество* (Journal of the Bulgarian Economic Association, JBEA), *Стопанска мисъл* (Economic Thought, ET)[7] and *Архив на стопанската и социална политика* (Archive for Economic and Social Policy, AESP). Of course this selection is far from complete, but the time restraint only allowed for this. All three journals were analyzed beginning with the issues of late 1929 and continuing well into the 1930s. The three were selected after a careful research of previously conducted analyses of the period[8] in order to allow for some representativity (JBEA being the most official publication of the community) and simultaneously to depict some heterogeneity of the economists' profession in Bulgaria at that time (ET being a more theoretical series than JBEA, and AESP being affiliated to social-democrat doctrines).

Overall, this study suggests that today's economic policy advisors in Bulgaria may well learn a lot from their predecessors' experience in the 1930s. Since both the situation of the Bulgarian economy and the nature of the global crisis then and now are not dramatically different, it might indeed prove helpful to take a detailed look at the debates back in the 1930s. Of course history never repeats itself, but it would be good not to repeat the mistakes of the past. For this reason the economic profession might itself be well advised to spend more time on the history of its own thought, something which is unfortunately more and more neglected in the teaching of today's mainstream economics at modern universities. The current paper may be perceived as a marginal contribution to the contrary.

## 2. Description of the Bulgarian Great Depression 1930–1935

This paper is focused on history of economic thought, not on economic history, so this part of it should remain brief. In the last years, there have been some publications trying to reconstruct the data regarding the economic development of Bulgaria in this period,[9] so a brief sketch based on the cycle reviews in the three journals should suffice here.

The Bulgarian crisis[10] started somewhat later than its global counterpart, namely in the second half of 1930, and the initial shock did not come from the bubble on Wall Street.[11] It was the bursting of another bubble that af-

[7] Since from the publications themselves it does not become absolutely clear when the first volumes of this journal appeared (late 1929 or early 1930), the author decided to quote the first collection of papers as 1930, vol. 1.

[8] The most encompassing œuvre of the Communist period probably is the two-volume edition of *Натан, Ж., К. Григоров, Л. Беров, Ст. Мечев, Т. Трендафилов* (1973).

[9] See most notably the works of Dr. Roumen Avramov and Dr. Martin Ivanov.

[10] For an interesting quantitative and graphical analysis of the Bulgarian development prior to the crisis see *Михайлов, Н.* (1930a), pp. 50–55.

[11] For the extremely rapid spread of the initially purely financial crisis from the USA to Europe see

fected the economy in the whole of South-Eastern Europe much more severely and directly: the end of the chaos on the agricultural market.[12] Since Bulgarian economy of that time was primarily agriculture-oriented (some estimates suggest that around 80 per cent of the population were engaged in this sector)[13], the rapid and sharp plummeting of the prices, *e.g.* wheat prices, had a very deep impact on the country.[14] Bulgaria's agriculture was, according to analyses of economists of that time, highly inefficient when compared to the productivity of other European and especially to North-American farmers.[15]

The problem became even more serious due to the credit boom in the economy between 1927 and 1929[16] which directly preceded the slump.[17] The credit expansion was generated by the exterior influx of capital, both from the stabilization credits to government and from private, mostly American short-term[18] funds.[19] In this boom many farmers were willing to accept credits from financial institutions which turned out to be only payable if the high prices for their products as before the slump would persist.[20] The ensuing farmers' debt crisis is a characteristic and very often pronounced feature both of the economists' and the politicians' debate about the crisis.[21] The stability of the political system, weak as it was in that period, was additionally endangered by this phenomenon.[22]

A feature which Bulgaria has in common with other economies in the Depression is the extremely steep drop in the general price level, both wholesale and retail. Although it was the time when price indices were just being conceived and implemented,[23] there is overwhelming evidence in the reviews in JBEA that for the first years of the crisis prices went down by about

*Ботушаров, Д.* (1930). For an analysis of the price development before the Depression see *Ляпчев, А.* (1932), pp. 531–533.

[12] For some numbers on this agricultural bubble in the pre-crisis years see *Ляпчев, А.* (1930), p. 497 and p. 510. For an early analysis of the spread of the impulse after the burst of the bubble see *Кръстев, С.* (1930б), pp. 101–103. A retrospective analysis in the bubble with time-series can be found in *Каменаров, Н.* (1933), pp. 24–25.

[13] See *Бобчев, К.* (1931б), pp. 471–472.

[14] See e.g. *Цанков, Ал.* (1932), pp. 10–12.

[15] See *Бобчев, К.* (1931б), p. 474.

[16] For an overview of the development of the credit system in Bulgaria before the crisis, including some time series, see *Кръстев, С.* (1930а).

[17] For the ensuing credit crunch and rise of credit interest see *Чакалов, Ас.* (1930), p. 223.

[18] For the primarily short-term character see *Чакалов, Ас.* (1934б), p. 201.

[19] For the first signs of withdrawal of such funds from Bulgaria as early as the beginning of 1930 see *Чакалов, Ас.* (1930), p. 222.

[20] See *Загоров, Сл.* (1933а) as well as *Чолаков, Ст.* (1932), pp. 142–143.

[21] See e.g. the discussion in *Цанков, Ал.* (1932), pp. 10–12.

[22] For an overview of the political dynamics in Bulgaria in the early 1930s, see *Джидров, П.* (1930), pp. 66–71.

[23] For the state of their implementation in the Bulgarian context see *Загоров, Сл.* (1935).

40 per cent, a figure which is even higher than those in Western European economies.[24] This severe deflation was, together with high unemployment figures, certainly one of the most painful symptoms of the overall slump and phased out somewhat in the mid-1930s.[25]

The outcome of these economic difficulties was a strong drop in both exports and imports.[26] The current account, however, was not in a particular disequilibrium, probably also due to the so called "foreign exchange monopoly" which was institutionalized at the BNB and imposed drastic measures on financing of imports. The reasoning of the Bulgarian economists about this arrangement will be found below.

An accompanying phenomenon was also the major distress in the financial sector of the economy. Various banks went bankrupt; many others were compelled to merge. Since the capital market was hardly developed at that time,[27] difficulties for banks, being thus the only source of finance, automatically lead to further repercussions on the real sector.[28]

Interestingly, the Depression continued longer in the Bulgarian context as compared to the Western economies. Unlike the saying of modern textbooks on economic history which very often mark the end of the crisis with 1933[29], Bulgarian problems persisted well into 1934 and ended as late as 1935.[30]

This was again due to the predominant agricultural sector which saw only a slow recovery from the shock and was on top plagued by some bad harvests in this period.

[24] For some indications of the early sharp slump in prices see *Чакалов, Ас.* (1930), pp. 223–224. An international comparison of the price development until 1933 can be found in United Nations (1933). Highly valuable time-series for different countries, also separated according to their currency arrangement, can be found in *Христофоров, Ас.* (1936а), p. 177 (wholesale price indices), p. 179 (retail price indices) and p. 181 (wages).

[25] For the only slight improvements in the course of 1935 see *Чакалов, Ас.* (1935б), pp. 436-441.

[26] The degree of openness of the Bulgarian economy is discussed in the analysed publications. Interestingly, some state that it belongs to the European countries with a relatively low proportion of exports and imports to national income (see also footnote 33). The openness with respect to capital flows is significantly higher; see *Бобчев, К.* (1932В), pp. 665–666. For an estimate that the Bulgarian foreign trade dropped in the first three years of the crisis by more than 50 per cent, see *Тодоров, Д.* (1933), p. 16.

[27] See *Мишайков, Д.* (1934), pp. 638–641.

[28] For an outstandingly detailed analysis of the Bulgarian banking system during the crisis see *Кемилев, Ас.* (1936).

[29] For a similar assessment of a contemporary Bulgarian economist see *Христофоров, Ас.* (1936а), pp. 175–176.

[30] For a contemporary judgement that the year 1935 is the turning point for Bulgaria's crisis see *Христофоров, Ас.* (1936б), p. 237, as well as *Христофоров, Ас.* (1936В), pp. 437–438.

## 3. First Analogies between the Great Depression and the Current Situation in Bulgaria

Before turning to the scientific debate in the 1930s, some striking similarities between the description of the Bulgarian crisis then and now can be outlined here. These can be perceived by the reader as a first strong claim that the debate reconstruction might also be seen as at least partially applicable to the current difficulties.

The first feature is a mass-psychological one and is thus difficult to verify but seems nevertheless hardly negligible. In the 1920s and 1930s the public and the economics profession shared one opinion of particular interest: the thesis of a perennial and not only cyclical crisis. That is to say that the Depression after 1929 is not to be seen as a purely isolated slump, but more in the broader perspective of a crisis which started right after the Balkan wars 1912–1913.[31] Of course, the severity of the Depression was different from the preceding periods, and of course the period 1912–1929 was not uniformly bleak, i.e. there were some sub-periods where a temporary prosperity could be felt, as in the credit boom of 1927–1929. Overall, from a psychological perspective, the Depression seemed as a culmination point of something lasting for more than 15 years.

The analogy to the current Bulgarian public opinion is evident. The 20 years between 1989 and 2009 have been a period of transition, including permanent transformation and also distress for many citizens. Of course, it cannot be denied that the years directly before the 2009 slump have been objectively years of stable macroeconomic growth in many indicators. As people seem, however, to be lagging the realization of such a process, there are large layers of the population who still live a life characterized by a subjective opinion of crisis. The credit boom of the recent years and the inflow of Western FDI have certainly strongly improved the situation. But even in prosperous Sofia the saying "we have been in a crisis for 20 years, so we are not afraid of some Western financial crisis" can often be heard these days.

The second analogy is concerns the setting of Bulgarian economy in the global context then and now. The first wave of globalization, as economic historians agree, characterized the world before the outbreak of the Great War. After it, in the 1920s, there were significant efforts to overcome the war-induced obstacles and to come back to global economic integration. The comeback of the Gold Standard in many countries during the 1920s was probably the most visible sign of this development. So the period before

[31] A prominent proponent of this thesis is a former Prime Minister – Professor Alexander Zankoff, see *Цанков, А.* (1932). This is also shared by social-democratic theorists, see e.g. *Николов, Д.* (1934), p. 25.

1929 can be seen as a time of increasing international interdependence.[32] The same is the picture of today's Bulgaria in the current second wave of globalization. In both time-spans Bulgaria can be classified as a small open economy, strongly intertwined with the exterior world especially by capital flows.[33] Thus Bulgaria is strongly susceptible in both periods to external shocks on the global markets, be they financial or real sector shocks. Moreover, its characterization as a small economy imposes a strong constraint on the quantitative impacts which its own economic policy can generate in such a setting. This will be further discussed below.

A third striking similarity is the currency arrangement which frames the economy in the 1920s and today. In 1928, after many preceding steps, the lev was eventually fixed to a gold parity and a Gold-Exchange Standard was introduced by law.[34] Thus the monetary circulation was guaranteed not only by the gold stock of the BNB, but also by the foreign currency reserves in the Bank of gold-covered currencies (which were the predominant ones before 1929). This setting strongly reminds of the Currency Board implemented in Bulgaria 1997. Both arrangements pose a specific constraint on Bulgarian monetary policy which is not as free as it would be in a purely fiat money standard.

A fourth characteristic which the crises then and now have in common is the dynamics of the pre-crisis period. As it was briefly mentioned in the preceding chapter, the period before 1929 can be described as a phase of credit expansion or even credit boom. This is true both in Bulgarian and in international context. The Western European banking system was flooded by easy money coming mostly from the United States and this was then forwarded to some more peripheral economies like Bulgaria. The analogy to the period before 2007–2008 can hardly be overlooked. In this period two (related) sources of easy money were present: the policy of the FED, ECB & Co., as well as the huge amounts of FDI flowing into Bulgarian economy. Although it is true that the Austrian theory of the business cycle does not obligatorily belong to the common explanations of the crisis within the economic profession in Bulgaria at that time,[35] the fact of the preceding credit boom

[32] See e.g. *Михайлов, Н.* (1932б), pp. 458–459.

[33] I agree with Dr. Roumen Avramov's remark at the presentation of a draft of this paper at the BNB that trade was not a strong channel of integration during the 1920s and thus Bulgaria was a relatively closed economy if judged by its trade flows (see also footnote 26). Migration as the third channel of integration is certainly also present, but both in the early 1930s and today the big waves of emigration belong to the past, émigrés' numbers being stagnant or declining, see *Илиев, Ив.* (1935). For an assessment of the role of migration in alleviating economic crises see *Бурилков, Ж.* (1935б), p. 602.

[34] For the distinction between the „classical" gold standard and the gold-exchange standard in Bulgaria and an evalutation of the latter see *Стоянов, П.* (1930), pp. 21–23. Another critical assessment, as a response to Стоянов, can be found in *Каменаров, Н.* (1930).

[35] One of the mentionings of Ludwig von Mises in the context of his diagnosis of the Depression can

seems (from today's perspective) to be a theoretically interesting feature of the cyclical development in the 1920–1930s and in the 2000s.

So far, some first sketches have been delivered regarding the economic history of this period with a special comparative reference to today's situation. Having done this, now the core of this paper will be presented, focusing on the fascinating debate in the Bulgarian economic community during the 1930s.

## 4. The Economic Policy Debate of Bulgarian Economists after 1929

The aim of this core chapter is to give a well-structured overview of how Bulgarian economists saw the Great Depression and what their answers were to the challenges of this period. The intention of the author is not to show every detail of the discourse in the journals analyzed, but moreover to reconstruct the main lines of thought which characterize the publications.

What is (from a methodological point of view) characteristic for the debate, is the interception of two layers of argumentation which are nowadays classical for economic policy research, but which were new at the time of the publications. The dominating one is the *structural* level of advice, regarding the long-term oriented policies of the general economic development of Bulgaria, most importantly the attraction and accumulation of (internal and external) capital.[36] The second is the more *short-term* oriented layer, concerned with the direct *cyclical* difficulties of the Depression.[37] From the point of view of German ordo-liberalism, which as a science of economic policy came up precisely in this period, both layers depicted by this school, i.e. the so-called policy of order (*Ordnungspolitik*) and the policy of process (*Ablaufpolitik*) are present in Bulgarian debates. Of course, it is difficult to separate them, especially since for the Youngest Historical School, to which most Bulgarian economists belong as they received education in Germany, the distinction is only of secondary importance.[38] Another peculiarity of the debate, which is of significance for the reconstruction pattern and which also probably emanates from the German educational background of most

be found in *Бобчев* (1933б), pp. 212–213. For Mises' monetary reform proposals, as contrasted to these of Keynes and Cassel, see *Стоянов, Гл.* (1930), pp. 25–26. Hayek is only mentioned in a bibliography when his Prices and Production appears 1931.

[36] See e.g. *Цанков, Ал.* (1932), pp. 13. On the role of saving for internal capital generation see *Иванов, Ал.* (1933), p. 10. For a discussion of the role of external capital inflows in the Bulgarian economy see *Бурилков, Ж.* (1934б).

[37] The terms "structural" (*структурен*) and "cyclical" (*конкюнктурен*) are widely used, see e.g. *Цанков, Ал.* (1932), p. 8.

[38] For an exception with rather an ordo-liberal position of government as setter of rules of the game and not an active player see *Мишайков, Д.* (1934), p. 641.

Bulgarians at that time, is the tenet that economic policy is not a separated issue from the problems of social policy.

Thus in the following a stress is put on the interdependence of structural and cyclical policy proposals, but nevertheless for the sake of clarity an attempt is made to dissect them. As regards social policy recommendations, which are very common in the texts,[39] they will be subsumed in the chapter on structural economic policy, as they are of rather long-term significance and cannot be implemented in time to handle the Depression which was already in process.

## *4.1. Structural Policy: What is the Long-term Path of Development of Bulgaria?*

### *4.1.1. The Role of Government in Economic Policy*

There are of course various economic policy debate issues that can be attributed to the label "structural policy". One of them, the ever-present and central topic of the general role of government in economic policy can be put forward. A quick comparative view at the German-language debate of that time[40] shows that exactly in that time of severe crisis in the capitalist order, the question as to what the legitimate mixture of state and market is became even more pressing than it had been in the decade after the War. The answers in Germany are manifold, the upcoming of the Freiburg School of ordo-liberalism being the most lasting result of the debate.

In Bulgaria[41] the question was controversial for one additional country-specific sub-topic. This debate in Western countries is complex itself, but in the Bulgarian context a special attention was drawn to the role of government in a "young economy".[42] This was the name which the authors often attached to the problem of a relatively short independent economic development since 1879. Due to this reason, an interesting and sometimes puzzling consensus arises between the two fractions of liberals[43] and inter-

[39] Alexander Zankoff's main statement is that the social (and possible political) distress is at least as important as the purely economic disturbances, see *Цанков, Ал.* (1932). For a similar stance, see *Янулов, Ил.* (1933), p. 71–74.

[40] The author of the current article has conducted a part of his PhD research on this topic.

[41] For an outstanding contribution regarding the compatibility of capitalism and the specificity of Bulgarian development see *Бочев, Ст.* (1931), pp. 69–78.

[42] See *Бобчев, К.* (1930), pp. 213–214 as well as *Бобчев, К.* (1931б), pp. 484–485. See also *Мишайков, Д.* (1934), p. 619.

[43] The term "liberal" is employed in the entire paper in the (classical) European, not in the American sense.

ventionists[44], the two groups characterizing the whole debate in Bulgaria[45] (as everywhere else[46]). The line of consent is that even for economists perceived otherwise as liberals, the role of government should be an active one, strongly fostering the development of the often inefficient structures in the country. This means that, unlike the few remaining liberals in Western Europe (who in their majority still believe that government should be no more than a rule-of-law arbiter of the otherwise autonomous private agents), in Bulgaria a call for the strong hand of a true player in the economy can be almost[47] unanimously heard.[48]

Below this most general line of dispute which can be traced back in almost every year of the journals analyzed, manifold more concrete debates take their course and are often shining back on the role of government-issue.

### *4.1.2. Free Trade vs. Protectionism*

What accompanied Bulgarian politicians and academia from the inception of the Third Bulgarian Kingdom to 1944, was the constant issue about the appropriate foreign trade regime for Bulgaria.[49] The line of division, separating again interventionists from liberals,[50] is the separation between the adherents of protectionism and the adherents of free trade.[51] There is some similarity in the chain of argumentation when compared to the previous paragraph when looking at the reasoning of the proponents of liberalism. They often stress that as economists, they cherish the benefits of the international division of labour. However, "free-traderism" of the Manchester school origin seems to them out-of-date. Especially for the context of a relatively under-

[44] For an explicit mentioning of the two camps and terming them (after Ludwig von Mises) "interventionists" and "liberals" in the debate see *Бобчев, К.* (1931a), pp. 360-361. See also *Калинов, Д.* (1935a), p. 65.

[45] For an interesting exposition of the conflict between liberalism and interventionism in Bulgaria, the obituary of the prominent Bulgarian politician and economist Andrey Lyapcheff might be instructive; see *Бобчев, К.* (1933B).

[46] Preliminary results of this paper were presented at a conference on May 20th 2009 by the Ministry of Finance on the occasion of its 130th anniversary. A similarly targeted paper was presented by Professor Michalis Psalidopoulos on the experience of Greece in the Great Depression. Without any coordination in advance between us, Professor Psalidopoulos characterized the two most significant groups in the Greek debate as "liberals" and "interventionists".

[47] I thank Dr. Roumen Avramov for his comment at the presentation at the BNB and after reviewing the respective publications agree with him that Stoyan Bocheff must be viewed as a notable exception from this consensus; see *Бочев, Ст.* (1935) and especially *Бочев, Ст.* (1931).

[48] For an enumeration of criteria for such an activist state by the otherwise liberal economist Konstantin Bobtcheff see again *Бобчев, К.* (1930), pp. 219–220. The stance of former Prime Minister Alexander Zankoff who pessimistically sees interventionism gaining the upper-hand during and after the Depression is also of interest, see *Цанков, Ал.* (1932), pp. 18–19.

[49] For a historical exposition of the Bulgarian debate on this issue which "has been a century-long controversy of economic science" see *Бобчев, К.* (1935), pp. 466–467.

[50] Alternative labels borrowed from the Viennese economist Othmar Spann are "individualists" vs. "universalists", see *Екимов, Ив.* (1932), pp. 638–640.

[51] For a liberal argumentation against the ideal of autarky see *e.g. Цанков, Ал.* (1932), pp. 4–5.

developed and agrarian country as Bulgaria, they (intuitively) tend to cling to Friedrich List's "nascent industry" argument. Thus liberals and interventionists can be distinguished not so much according to their conclusion, which is that some tariff protection is indispensable.[52]

Two other principle differences arise, however, which allow for a certain separation of the two "camps". The first is the acceptance of free trade benefits in general and the second is the mode of development which is desirable for the post-crisis development.[53] As regards the first, interventionists unlike liberals see in an opening of the economy a potential weakness due to the increased susceptibility to external shocks. As for the second, that period saw the building of commercial blocs (such as the Sterling bloc around the UK) and hence the global multilateral integration (with its peak in 1914) to disintegrate.[54] Bulgarian economists uniformly realize that the small size of Bulgaria's market makes it absolutely necessary to participate in some form of economic integration.[55] The division is visible, however, between the large majority who increasingly favoured a bilateral trade adherence to the German bloc via clearing contracts[56] and those who preferred a multilateral solution.[57] During the 1930s, the latter became more and more unrealistic due to the pre-war processes in the West.[58] An additional impediment to multilateral trade flows and in favour of bilateral clearing agreements are the strong exchange controls which are instituted in many countries of that period, including in Bulgaria at BNB[59] as discussed below.

### *4.1.3. Free Competition vs. Cartels*

A related topic which is not quite as prominent in the discussions but still is worth dissecting, is the internal trade regime, *i.e.* the debate between adherents of free competition and those of cartels and monopolies.[60] Again, the stylized separation into liberals and interventionists bears some explanatory power. The major line of division is whether competition is to be judged

[52] For an articulation of this consensus, see *Михайлов, Н.* (1932б), pp. 443–444.
[53] On the second, see *Пеев, Хр.* (1932).
[54] For an assessment of the dynamics of this development see *e.g. Кръстев, С.* (1933), pp. 46–47.
[55] See *e.g. Бобчев, К.* (1931б), p. 489.
[56] One of the first treaties was signed in June 24th 1932. For an assessment of the integration between Germany and South-East European economies see *Пиперов, Ив.* (1936) or *Тошев, Д.* (1934).
[57] For an exposition of the specificities of the trade regime for agrarian economies see *Свраков, Г.* (1931).
[58] For an interesting analysis of the political economy of autarky (with a mentioning of Walter Eucken's seminal article of 1932) and its relation to the arguments for a planned economy, see *Петров, Н.* (1933), pp. 62–65. Another mentioning of the same article of Eucken can be found in *Божиков, С.* (1933), p. 138–139.
[59] For a discussion of the individual foreign exchange regimes in different countries in the beginning of the 1930s see *Калинов, Д.* (1935б), pp. 278–280.
[60] According to one participant in the discussion, cartels and trusts have "undoubtedly buried classical liberalism", see *Пеев, Хр.* (1932), p. 630.

in a positive or in a negative manner.[61] A predominant tendency can be discovered in the texts in this respect to speak of (in Marxist language) the problems of "anarchistic character of competition"[62] which can also be seen as one of the reasons for the Depression.[63] A minority is speaking of the great benefits of competition, *e.g.* regarding the incentives for dynamic economic development. Bulgarian economists spend of course some thoughts on the issue of anti-trust policies and are generally in favour of some intervention of government to curtail monopolies and cartels.[64] Unlike in upcoming German ordo-liberalism, however, they do not propose this due to a particular cherishing of competition, but rather from the injustice perspective that the "unfairly high prices" imposed by such non-competitive actors are an impingement on the individual customer's budget. Interestingly, even some argumentation can be traced down which states that cartels can be of use for stabilizing prices especially during such slumps as the Depression.[65]

#### *4.1.4. Market Economy vs. Planned Economy*

Collective entities like cartels, thought to the end, tend according to Schumpeter to be a step towards a collectivist or centrally planned economy. Looking at the experience of Soviet Russia, as well as at the fundamental Western discussions of the 1920s and 1930s regarding the possibility and desirability of a planned economy,[66] Bulgaria's economists pose the question as to whether "time has come" for a switch from the market to a planned economy.[67] The issue is strongly related to the Depression, since Soviet Russia obviously (despite mass famine) succeeds in convincing the world that the Great Depression has hardly affected its economy.[68] Together with the "anarchistic competition" argument stated above, this leads to the question whether planned economy is at least a temporary device in times of crisis. This would mean that in periods characterized by such significant slumps, government is to take the initiative from the privates and thus prevent the chaos of (in Keynes' words) self-accelerating private investors' herd behavior to the bottom. However, a consensus emerges in the Bulgarian periodicals (not shared by AESP authors) that the solution cannot be sought in such a

[61] For a balanced analysis of both sides see *Стоянов, К.* (1934), pp. 311–312. For an emphasis on the fight against "unfair" competition and an agenda for competition policy see *Близнаков, Т.* (1936).
[62] See e.g. *Калинов, А.* (1931), pp. 329–330.
[63] See *Калиниов. Т.* (1932), p. 25.
[64] For a discussion of the Bulgarian legislation on cartel and monopoly prices passed in 1931 see *Бобчев, К.* (1932a), pp. 44–45.
[65] For this argument see *Петров, Н.* (1931), pp. 93–94.
[66] For an assessment of the first Five-Year-Plan see *Николов, Д.* (1933).
[67] For a theoretical overview of the different possible sub-types of planned economies see *Бочев, Ст.* (1935).
[68] For a relatively uncritical assessment of the Soviet development see *Джидров, П.* (1932a).

radical transformation of the economy, neither temporarily nor permanently.[69] The crucial argument against it that, even if implemented temporarily, it would totally suffocate private activity and thus the economic system would lose its essential features. If a centrally planned economy would be introduced once, according to the Bulgarian authors, a coming back to market principles in better times would hardly be possible.[70]

#### *4.1.5. Agrarian Economy vs. Industrial Economy*

But even if a consensus for the market principle is thus present, the question as to which the relevant markets for the country's future economy should be is to be additionally posed. It is not difficult to discern that this issue is the topic of *agrarian vs. industrial economy*. Communist propaganda after 1944 raised one of its major objections against the "bourgeois" economists that they have left the country in the "medieval agricultural structures" and that they have not actively proposed industrialization for Bulgaria.[71] This is to a certain extent true. The economists in the analyzed periodicals would indeed not support an aggressive industrialization of Bulgaria as practiced after 1944.[72] There seems to be a consensus that the comparative advantage in the 1920s and 1930s is in agricultural production. This, however, does not mean that the economists were pure proponents of the status quo. Instead, in various publications the inefficiency of the current structure of the agricultural sector is heavily criticized.[73] In the end, an evolutionary rather than (the later communist) revolutionary path is chosen, where improvement can be reached via voluntary unions like the ones proposed by the cooperative movement,[74] not by violent nationalization and urbanization.

#### *4.1.6. Economic Policy and Its Relationship to Social Issues*

As pointed out above, the debate on structural policy issues is not only a purely economic one. The Bulgarian economists, mostly trained in the tradition of the German Historical School, follow their academic teachers in showing that economics without being embedded in a larger context is not sufficient. This means that when discussing *e.g.* the role of government in economic policy, not only economic, but also sociological and social policy considerations are to be taken into account.[75] The economic community

[69] See *Бобчев, К.* (1933б).
[70] See *Кинкел, М.* (1933), p. 417. This consensus of the mainstream is, however, not shared by authors of AESP, see e.g. *Джидров, П.* (1932б).
[71] See e.g. *Натан, Ж.* (1964), pp. 221–233.
[72] See *Бобчев, К.* (1931б), p. 486.
[73] See e.g. *Яранов, Ат.* (1931).
[74] See *Бобчев, К.* (1930), pp. 215–216, as well as *Мишайков, Д.* (1935).
[75] This is even more so the case in the reviews of the AESP, where economic and social aspects are explicitly treated with equal attention. An analysis of the problems of unemployment can serve as a

realizes that all sophisticated policy advice might become worthless if the political and social order collapses due to the social repercussions of the recommendations.[76] Bearing in mind the development in Germany in the beginning of the 1930s, this seems to be a far-sighted observation. Walter Eucken's starting point for his theory of order (*Ordnunugstheorie*), which began evolving exactly at that time, is the so called interdependence of orders, i.e. precisely the fact of the relatedness of all economic (and social) policy which the Bulgarian economists intuitively see.[77] In contrast, the Austrian School economists like Friedrich A. von Hayek and Ludwig von Mises insufficiently took into account the issue of the political and social dangers of deflation, as Hayek himself confesses in the 1970s.[78]

### *4.2. Cyclical Policy: What Are the Appropriate Short-term Policies for Bulgaria During the Crisis?*

In the previous chapter, the first layer of the economic policy debate was disclosed, that of determining the structural parameters of Bulgarian economy. The timing of those measures is mostly a long-term one, which underscores the fact that the majority of Bulgarian economists were arguing that the crisis is co-driven by the structural deficiencies of the country's economy. The Depression plaguing the country, however, could in their eyes also demand for some specifically anti-crisis measures which should alleviate the hardships of the slump. For this it is important to clarify here the positioning of the Bulgarian debate in the broader European context. Most importantly, Keynes had not yet published his *General Theory*. Politicians in charge of economic policy thus do not yet have the "scientific justification" for anti-cyclical policies which the British economist gave them with his reputation after 1936. In this way the Bulgarian debate is at the verge of these changing theoretical paradigms and reflects the great uncertainty which this quantitatively unique depression poses to both politicians and their economic advisors.[79]

The following figure can clarify the strata of the debate, distinguishing between the broader context of structural policy issues (including social policy) from the previous chapter and the directly cyclical responses of short-term character dealt with below.

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good example: see *Григоров, К.* (1932) or *Николов, Д.* (1934).

[76] See e.g. *Цанков, Ал.* (1932), pp. 22–24.

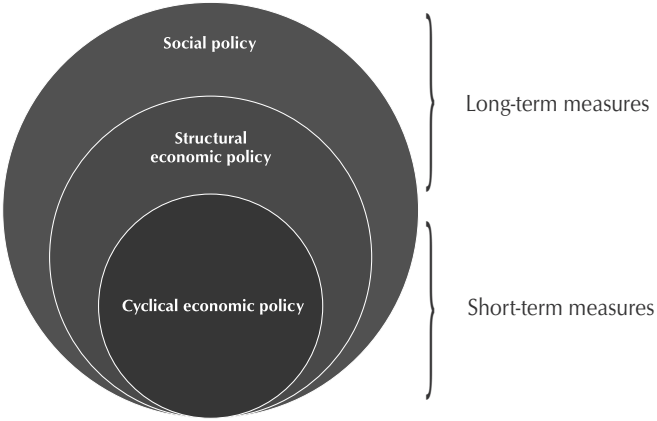
[77] For a good exposition of this embeddedness of economic and social policy see *Чолаков, Ст.* (1932), pp. 146–148.

[78] See *Hayek, F. A.* (1975).

[79] For some pre-Keynesian reasoning on the role of easy money see *Чакалов, Ас.* (1935B), pp. 571–575.

**Figure 1**

**DIFFERENT (COMPLEMENTARY) TYPES OF RESPONSES TO THE DEPRESSION**




### *4.2.1. Overview of the Competing Theoretical Explanations of the Depression*

As mostly in the history of economic thought, also at the time of the Great Depression one cannot speak of a singular theoretical answer which the economic community gives to the challenges of the real world. There are, instead, manifold doctrines[80] which are in circulation for explaining the coming up of this "end of capitalitsm".[81] It is not possible at this place to deal with them in detail since each would demand an individual paper of this size. Just a brief mentioning of the central topics should suffice.[82]

The first issue which is to be clarified is the question of the cyclicality of market economy.[83] This question relates to the topic of whether the major source of the crises which accompany economic growth is endogenous or exogenous. "Endogenous" would mean that the markets themselves are generating the observed instability, "exogenous" that it is external impulses that disturb the markets' functioning. To the endogenous group of theories be-

[80] A good overview of the circulating doctrines in Bulgaria can be found in *Божинов, С.* (1930) and, even more detailed, in *Божинов, С.* (1931). Additional doctrines can be found discussed in *Кираков, Пр.* (1931).

[81] For this slogan or Keynes' earlier "end of laissez-faire" as popular terms in the beginning of the 1930s see *Бобчев, К.* (1933б), p. 197.

[82] For a summary of the various theories circulating in the debates, see *Бобчев, К.* (1932б), pp. 55–59. Another compact reconstruction can be found in *Шишманов, Хр.* (1932), p. 64. See also *Бочев, Ст.* (1935), pp. 16–17.

[83] There is a consensus on the presence of this phenomenon, see e.g. *Михайлов, Н.* (1930а), pp. 46–47.

longs the (very popular among Bulgarians) "overproduction theory", which states that the crises are results of huge surpluses which the markets generate without corresponding demand. An example of exogenous explanation of the cycle is the theory of the credit boom (Mises calls it the circulation credit theory), which later becomes famous under the label "Austrian business cycle theory".[84] This theory, which in the Western debates of the time belongs to the mainstream, is shared more intuitively by Bulgarians,[85] probably due to the popularity of the related theory of the English Currency School of the 19th century. In its original form, that of Mises of 1912, it is the exaggeration and malinvestment of the exogenously ignited credit boom which invariably lead to a slump. Whether the Bulgarian credit boom mentioned in the previous chapters can be seen as such an initiating force is not sure, but what is certain in a global perspective is that the late 1920s were characterized by such an international credit boom.[86]

What is common to almost all articles dealing with the causes of the Depression, be they exogenous or endogenous, real or monetary, is the belief that Bulgarian cyclical difficulties are to a very large extent co-determined by the global development, both in the genesis and in the cure of the crisis. Thus the parameters for activity of the government and the BNB *via* cyclical policy in the small open economy, as will be seen in the following paragraphs, are not perceived by the Bulgarian economic community as particularly large. Truly in the spirit of the epoch, in the analyzed publications of the period some significant hopes for recovery and prosperity are directed at the international level,[87] *e.g.* at the multiple international conferences dealing with economic and reparations problems.[88] This is not to mean, however, that nothing is to be done in Bulgaria: a series of both monetary and fiscal issues are widely discussed and recommended to the politicians for adoption.

### *4.2.2. Discussion of Monetary Policy Measures*

What should be mentioned in the first place regarding the power of monetary measures in Bulgaria of the 1930s is that it is widely perceived by the

[84] Hayek in his Habilitation thesis proposes an endogenous mechanism via the banking system's capability to create money. Originally, however, in the version of Mises' Habilitation, the beginning of the cycle is exogenous, *e.g.* by a decrease of the interest rate of the central bank; see *Mises* (1912/24) and *Hayek* (1929/76).

[85] For a brief overview of the early diagnoses of the crisis among the Bulgarian political and economic establishment see *Михайлов, Н.* (1930б).

[86] The characteristically Misesian term of "credit inflation" can be found *i.a.* in *Бобчев, К.* (1932б), p. 57 or *Божинов, С.* (1930), p. 78.

[87] See *e.g. Джидров, Гл.* (1933), pp. 185–186.

[88] See *e.g. Янулов, Ил.* (1933), p. 83, *Чакалов, Ас.* (1933а), pp. 288-298, as well as *Чакалов, Ас.* (1933б).

country's economists as relatively weak.[89] The reason for this is the strong agricultural character of the Bulgarian economy of the time.[90] Certainly farmers obtained credits from the banks, but still the agriculture in the country possesses a very low capitalization. In addition, some of the exchange of harvested goods was settled in a barter fashion, which additionally diminished the power of monetary measures. Nevertheless, for the upcoming industry and the non-barter sector of the agricultural sector, the monetary setting is not unimportant.[91]

As pointed out in the section dealing with the facts around the crisis, the monetary conditions in Bulgaria after 1928 and thus for the whole period of the Depression were determined by the Gold-Exchange Standard. Thus some automatism is present for the BNB monetary policy, limiting its discretionary power.[92] Thus the question arises as to what the proper role of the Central Bank is during the crisis and how it should position itself against the severe difficulties of the economy.

There are extensive discussions in the Bulgarian economic community regarding the functioning of the monetary setting during the 1920s and early 1930s.[93] Since most European countries adopt different types of gold-related standards after the inflationary period following the War,[94] the debate on the suitability of gold as the anchor of the system is applicable both to the international and the national monetary question.[95] As in the Western debates, the common hoarding and "sterilizing" of gold, as performed by the major central banks of the inter-war period, is heavily criticized by the Bulgarian economists. They describe this behaviour as a major impediment to the proper working of the standard as compared to its smooth functioning before 1914.[96] Thus there is a criticism towards the concrete implementations of the mechanism in the post-war period.

This is, however, not to be confused with a general critique of the idea of

[89] See *Бобчев, К.* (1930), p. 216.
[90] For a discussion of the official (government's) policy proposal, with a special focus on agriculture, see *Коларов, Ив.* (1930), pp. 281–298.
91 For the role of money and interest rates in a predominantly agricultural economy see *Кожухаров, Г.* (1930), pp. 113–115.
[92] For the role of a central bank in the setting of a gold-exchange standard, see *Бурилков, Ж.* (1935a), pp. 86–90.
[93] For an analysis of the role of central banks as generators of credit inflation in the expansionary years preceding the Depression see *Калинов, Т.* (1932), pp. 27–31.
[94] For a discussion of monetary reforms in different countries before and during the Depression see *Чакалов, Ас.* (1936б).
[95] For an overview as to where gold-related standards are still in place 1933 see United Nations (1933), pp. 524–525.
[96] For the problems related to gold in the crisis see *Михайлов, Н.* (1932a), pp. 93–94 and pp. 102–105.

a gold-related standard itself. The absolutely predominant[97] judgment among Bulgarian economists is that a fiat money standard as present in the Western discussions, promoted i.a. by Keynes, is not a preferable alternative to the gold-related mechanisms.[98] The reason for this is probably to be seen in the experience during and after the War when various fiat currencies have disappeared after tremendous processes of hyperinflation. Thus the belief in the stability of government-managed currencies as proposed by Keynes is very weak in Bulgaria. The stability of money, seen as one of its essential characteristics for assisting the market economy, can only be guaranteed in the eyes of Bulgarians by an automatic or semi-automatic mechanism as the one established 1928.[99]

What is the proper role of the BNB in this context?[100] Although the issue is legally settled already in the 1920s,[101] there is still a persistent discussion on this issue in the analyzed journals.[102] The first layer of discussion is whether the Central Bank is supposed to be "only" an emission institute or also a part of the credit system of commercial banks. There is, understandably, no absolute consensus on this issue.[103] What seems to be the majority position is that there should be a division of labour between the different government banks, leaving the BNB as a unique place of guarding the financial system and not being an active player in it in the rank of a (large) commercial bank.[104] Another discussion is focused on the foreign exchange monopoly (*камбиален монопол*) which was entrusted to the BNB[105] and which is discussed (mostly very positive) as a seminal part in the stabilization of the currency.[106]

It is difficult to judge from the publications how well the transmission mechanisms of the Central Bank's policy were functioning in that period. Of

[97] An exception is the statement of Alexander Zankoff who sees the gold standard as doomed, see *Цанков, Ал.* (1932), pp. 7-9.
[98] There is, however, a discussion as to the difficulties for immediate recovery of the economy due to the fixed exchange rate in a gold standard, see *Христофоров, Ас.* (1935), pp. 259–261.
[99] See *Бобчев, К.* (1931б), pp. 484–485.
[100] For the financial situation of BNB in the eve of the crisis see *Лещов, П.* (1930), pp. 148–150.
[101] Again, I thank Dr. Roumen Avramov for his comment on the preceding debate in the 1920s which could not be covered in the present paper due to the different period of the analysed journals. The most detailed and critical analysis on the proper role of BNB in the analysed period, with a special focus on the interrelationship between currency policy and general economic policy and the resulting trade-offs, can be found in *Тодоров, Д.* (1933).
[102] For an overview article on this topic see *Бурилков, Ж.* (1935а). Of interest is also the ensuing discussion in the Bulgarian Economic Association, see *Стоянов, Н.* (1935) or *Христов, Н.* (1935).
[103] For a good exposition of the discussion see *Чакалов, Ас.* (1935В).
[104] See *Бобчев, К.* (1930), p. 214.
[105] For a retrospective six years after the establishment of the foreign exchange monopoly at BNB see *Владикин, Л.* (1930).
[106] See e.g. *Екимов, Ив.* (1934) as well as *Икономов, Ст.* (1934). For a critical assessment and a proposition for liberalization after the Depression see *Бурилков, Ж.* (1935б). Another note dated before the crisis can be found in *Лещов, П.* (1930).

course, money and capital markets in Bulgaria at that time were in a really nascent state. From this one might infer that the role of thr BNB for financing the operations of commercial banks was important due to the lack of an institutionalized inter-bank lending. Thus the role of the main discount interest rate seems to be significant,[107] and even more so after the legislation proposed in 1932 and passed in 1933 which prohibited commercial banks' interest rates to excel BNB's discount rate by more than 3 per cent.[108] Interestingly, in Bulgaria there are no huge variations in this rate during the analyzed period, it ranged between 10 per cent in 1930[109], 9 per cent in 1931[110], 8 per cent in 1932[111], 8 per cent also in 1933[112], 7 per cent in 1934[113] and 6 per cent in 1935[114]. This is a clear indication of the relatively conservative policy of BNB during the Depression. Bearing in mind the huge deflation rates shown above, one can clearly claim that the real interest rates for the economy were extremely high at this critical time.

As a concluding remark to this chapter, it may be interesting to state that in spite of the strong deflationary pressures in the Bulgarian economy,[115] within the economic community there seems to be no Keynes-like anti-deflationary zeal urging for inflationary policies.[116] Such ideas were of course discussed in the publications, but were mostly rejected due to the perception of severe dangers for the newly established monetary stability in Bulgaria emanating from them.[117] For the same reason, a devaluation of the currency, as practiced by many European countries, is discarded by the economic community and indeed Bulgaria as one of the very few countries does not devalue in the whole of the analyzed period.[118]

### *4.2.3. Discussion of Fiscal Policy Measures*

The other part of today's canon in anti-cyclical policy is the role attributed to fiscal measures.[119] To begin with, the state of the Bulgarian public finances

[107] See e.g. *Мишайков, Д.* (1934), pp. 631–632.
[108] See *Бобчев, К.* (1933а), p. 117.
[109] See *Близнаков, Т.* (1931), p. 294.
[110] See *Бобчев, К.* (1932), pp. 51–52.
[111] See *Загоров, Сл.* (1933б), p. 49.
[112] See *Чакалов, Ас.* (1934а), p. 114.
[113] See *Чакалов, Ас.* (1935а), p. 39.
[114] See *Чакалов, Ас.* (1936а), p. 45.
[115] The highly restrictive policy of the BNB and their possible relation to deflation is discussed in *Калинов, Т.* (1932), pp. 35–36.
[116] For an early acclaim of such a non-inflationary policy see *Чакалов, Ас.* (1930), pp. 222–223. Easy money policy is also rigorously discarded in *Иванов, Ал.* (1936), p. 583–584.
[117] See e.g. *Калинов, Т.* (1932), pp. 37–38.
[118] For an outstanding contribution on the issue "deflation vs. devaluation" see *Христофоров, Ас.* (1935).
[119] An interesting note on the interdependence of monetary and fiscal policy can be found in *Петков, Й.* (1930), pp. 120–121.

was chronically difficult in the 1920s since heavy war-related reparations had been burdened on the country in the Peace treaties.[120] However, it might be interesting to note that before the crisis there are some years of surpluses in the budget,[121] which can be interpreted as a sign of rigorous control of the budget's expenditure side. The surpluses not surprisingly disappear,[122] mainly due to a significant drop in tax revenue as early as in the budget 1930/31.[123]

An interesting starting point of the discussion is the share of government in the national income at that time.[124] Since the series of national accounting only started developing in this period, one must rely on some estimate figures. Fortunately, such approximate numbers can be found in JBEA and they suggest that the share of government in the economy is about 30 per cent.[125] If one accepts this magnitude, the possible fiscal impulses which the Bulgarian government could generate seem to possess potential impact.

What could these impulses be? Most generally speaking, it would be increased by government expenditure *via* a temporarily unbalanced budget, *e.g.* for construction-related public works or direct subsidies for households or other sectors of the economy.[126] This is the place where the pre-Keynesian[127] character of the debate can be most clearly discerned. Such measures are, mostly[128] discarded by Bulgarian economists in their publications[129], *e.g.* by terming them purely "palliative".[130] Interestingly, AESP authors seem more sympathetic to such measures.[131] The reason for this consensus of the mainstream is similar to the argument for rejection of the monetary impulses: the omnipresent fear of (hyper)inflation,[132] regardless whether the financing should be by internal or foreign funds.[133] An additional restraint in the discus-

[120] For relationships between the crisis and the reparations problem see *Калинов, Т.* (1931).
[121] For the surplus in the budget 1929/30 see *Чакалов, Ас.* (1930), p. 222.
[122] For the nominally declining expenditures of the Bulgarian government in the years of the Depression see *Бурилков, Ж.* (1934а), p. 102. For an analysis of the 1933/34 state of public finance, see *Янчулев, Б.* (1934б).
[123] For the development of tax revenue 1930/1931 as compared to 1929/1930 see *Ралев, Гл.* (1930).
[124] For some estimates of the nominal national income development see *Янчулев, Б.* (1934а), p. 87.
[125] See *Близнаков, Т.* (1931), p. 297.
[126] See *Янулов, Ил.* (1931). For a sceptical assessment of the activity of Bulgarian economic policy in retrospective at the end of the crisis see *Чакалов, Ас.* (1936), p. 33.
[127] Keynes (having not yet published his *General Theory*) is very widely cited in the publications, however mainly due to his participation at the various international conferences and relatively seldom as an economic theoretician.
[128] For some sympathetic discussion of the economic policy measures in Germany after 1933, see *Миркович, Р.* (1934).
[129] A plea for cutting expenses in the crisis for balancing the budget can be found e.g. in *Цанков, Ал.* (1932), p. 21, also in *Янулов, Ил.* (1933), p. 82; see also *Янчулев, Б.* (1934а), pp. 85–86.
[130] See e.g. *Калинов, Т.* (1932), p. 33.
[131] See e.g. Михайлов, Н. (1933), pp. 254–256.
[132] For a strongly anti-inflationary stance see e.g. *Загоров, Сл.* (1933а), p. 5.
[133] *Янулов* is willing to discuss public works only if they are decided in an international accord and are internationally funded, see *Янулов, Ил.* (1931), pp. 638–640.

sions is posed by the unclear future of the public debt level of the country due to the unsettled reparations problem.[134]

## 5. Comparison with Today's Crisis in Bulgaria: Concluding Remarks

The first global financial and economic crisis of the 21st century is still (mid-2009) leashing back and forth between the major economic zones, strongly distressing also countries like Bulgaria whose interdependence has steadily risen over the last years. More than 70 years after the end of the Great Depression, economists are still in search of explanations for the crises of capitalism. Despite the huge progress in the analytical methods of prediction and the vast computing power behind them, many economists have stunningly failed to foresee the upcoming trouble. The public opinion, just as in the 1930s, blames the profession for its inability to warn it about the dramatic downturn of the cycle.

In such a setting, the history of economic thought can help in a twofold manner. First, it is evident that the lines of debate in the current crisis are very close to the "fronts" in the 1930s. (New and post) Keynesians demand stronger impulses by fiscal and monetary measures, Marxists of all shades see the doom of capitalism (finally) coming, liberals blame the (monetary) authorities for the earlier easy money as the fatal root of the crisis. Some fear particularly the immediate deflationary pressures of the slump, others the inflation in the process of recovery. The picture and choir of voices is at least as incoherent as it was 70 years ago.

There is, however, some hope, and this is the second side of the history of economics "lesson". The time of crisis is often a time of consolidation of paradigms. Society and academia not seldom have made their choices right after the crisis as to which the "leading" or "guiding" theory of economic dynamics should be for the next decades. For the 40 years after the Great Depression, Keynes and Keynesian economics succeeded in displacing all other explanations to the margins. In the 1970s, again at a time of crisis, monetarism and supply-side economics won the day for the next 30 years. Thus today the "battle of ideas" might be devastating for the profession's image in the impatient eyes of the public, but for economics itself it may be a catalyst for gaining the formation of a new prominent paradigm for the next years. Which this might be, can only be a matter of speculation at the current point of time. The issue is not yet decided.

[134] For a theoretically founded public finance perspective on the Bulgarian budgetary problems, see *Стоянов, П.* (1933).

As regards Bulgaria now and then, one of the most fascinating Bulgarian economists of the 1930s, Dr. Assen Hristoforov, should be quoted at this place with his retrospective of the crisis. The author of the current lines shares the optimism and confidence which Dr. Hristoforov exhibits in the market order when he stated back in 1936: "Despite all these difficulties, the capitalist economy has proven far more resilient than many imagined".[135] The doom scenarios both in a global perspective and especially in the case of Bulgaria seem hardly vindicated. Of course, every major crisis is a source of manifold economic and especially social troubles. Yes, it destroys plenty of prosperity achieved with a lot of painful effort prior to the depression. The *major* difference between the 1930s and today constitutes, however, a significant source of optimism. This difference is strictly speaking beyond the scope of economics and its history. It is the stability of the political system which undoubtedly poses the central distinction between the two crises. Dr. Hristoforov himself became a tragic intellectual victim of the disastrous aftermath, i.e. the spread of totalitarianisms of all kind before and especially after the Second World War. A similar political destabilization process seems highly improbable today, also because of the unprecedented degree of economic integration worldwide.

Thus economists today, in Bulgaria or anywhere else, fortunately have some more time to continue their discourse and find adequate answers to the pressing problems of today and even more so of tomorrow. The tenet of this paper is that it might be accelerating for this reflection to look back, reconstruct and thus trace down the debates in the past. This seems to be true in at least two key aspects: finding and reformulating inspiring ideas and simultaneously avoiding the mistakes of previous generations can only be achieved by knowledge of intellectual history and its evolution.

[135] See *Христофоров, Ас.* (1936a), p. 188.

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DP/80/2010

# Моделиране на лихвените проценти по кредитите за предприятия в България

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Резюме. Настоящото изследване моделира лихвените проценти по кредитите за предприятия в България в рамките на модели с корекция на грешката. Особено място в анализа е отделено на въпроса, как промените в лихвеното ниво по междубанковите депозити в еврозоната се пренасят върху лихвените проценти по кредитите за предприятия, както и на това, дали кредитният риск е фактор за динамиката на цената на заемните ресурси. Резултатите показват, че наред с лихвеното ниво по междубанковите депозити в еврозоната равнището на кредитния риск също е значим фактор за динамиката на лихвените проценти по кредитите за предприятия, главно в дългосрочен план. Моделирани са различни от гледна точка на срок и валутна деноминация на кредитите лихвени проценти, като според получените резултати дългосрочната реакция спрямо измененията на монетарните условия в еврозоната е по-висока при кредитите с матуритет до една година и при кредитите в евро. Придвижването към дългосрочното равновесие влияе върху краткосрочната динамика на лихвените проценти по кредитите, като дългосрочното равновесие се възстановява относително бързо. Възстановяването на дългосрочното равновесие не се характеризира с асиметрия, т.е. то се осъществява с еднаква скорост, независимо от посоката на съответното отклонение. Резултатите показват сходство с еврозоната по отношение на реакцията на лихвените проценти по корпоративните кредити, което е предпоставка за ефективно функциониране на механизма на паричен съвет.

Abstract. This study is aimed at modelling interest rate on corporate loans in Bulgaria using error-corrected models. The analysis is focused on the topic how changes in interest rates on interbank deposits in the Eurozone are transferred to the interest rates on loans to corporations, as well as what is the role of credit risk as a determinant of loan interest rates. The results show that along with the level of interbank interest rates in the Eurozone, credit risk has significant impact on the dynamics of interest rates on corporate loans, primarily in the long run. Interest rates on loans with various maturity and currency denomination are examined, and the results suggest that in the long-term perspective the effects of changes in the Eurozone monetary conditions are stronger for loans with maturity of up to one year and for loans denominated in euro. Adjustments towards the long-term equilibrium affect the short-term dynamics of interest rates on loans, while deviations from the long-term equilibrium are closed relatively fast. Adjustments to the long-term equilibrium do not have asymmetric patterns, in other words, their speed does not depend on the sign of deviations. The results point to similarities with the Eurozone in terms of the interest rate pass-through of corporate loans, which supports the effective operation of the currency board mechanism.

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## Съдържание

## Въведение

Формирането на лихвените проценти по кредитите е важен елемент от паричния трансмисионен механизъм. Лихвените проценти влияят върху решенията на предприятията и домакинствата по отношение на инвестициите и потреблението, което е особено важно в страните, където финансовата система е доминирана от банковия сектор, а банковите кредити са основната форма за привличане на заемни средства. Начинът, по който се формира ценовата политика на банките, е важен и от гледна точка на финансовата стабилност. От една страна, лихвените равнища по кредитите оказват влияние върху финансовия резултат на банките, който ако бъде използван за увеличаване на капиталовата база, може да служи като буфер срещу различните шокове, на които е изложена банковата система. Значението на лихвените проценти по кредитите за финансовата стабилност произтича и от факта, че от тяхното равнище зависи способността на длъжниците да обслужват задълженията си и съответно кредитният риск, пред който са изправени банките.

В това изследване е направен опит да се проучат възможностите за моделиране на лихвените проценти по кредитите за предприятия в България. Изследванията в тази област обикновено имат за цел да установят как промените в лихвеното ниво по инструментите на централната банка или лихвеното равнище на паричния пазар се пренасят върху лихвените проценти по кредитите (т.нар. *interest rate pass-through*). Въпреки общите си черти с тези изследвания, този материал се характеризира с две основни разлики в сравнение със стандартните изследвания. Първата особеност е свързана с избора на индикатора за монетарните условия, спрямо изменението в който се измерва реакцията на лихвените проценти по кредитите. Отсъствието на самостоятелна парична политика в условията на паричен съвет естествено налага вниманието да бъде насочено към въпроса как лихвите в страната реагират на промените в монетарните условия в еврозоната. Изучаването на този процес би задълбочило разбирането за влиянието на външните лихвени проценти върху икономиката на страната и за функционирането на паричния трансмисионен механизъм. Втората особеност е, че за разлика от изследванията в тази област, тук наред с монетарните условия е отчетена ролята и на кредитния риск като фактор при формирането на цената на заемните

ресурси. Този въпрос заслужава внимание с оглед на значителните промени в икономическата конюнктура през последните години и започналото през 2008 г. отражение на глобалната финансова криза върху българската икономика. Резултатите потвърждават хипотезата, че наред с лихвеното ниво по междубанковите депозити в еврозоната, в България значим фактор за динамиката на лихвените проценти по кредитите за предприятия е и равнището на кредитния риск.

В изследването лихвените проценти по кредитите за предприятия са моделирани в рамките на модели с корекция на грешката, което дава възможност да се направи разграничение между краткосрочна и дългосрочна зависимост между променливите. Тези модели са приложени за различни лихвени проценти от гледна точка на срок и валутна деноминация на кредитите. Според получените резултати дългосрочната реакция спрямо измененията на монетарните условия в еврозоната е по-висока при кредитите с матуритет до една година и при кредитите в евро. Придвижването към дългосрочното равновесие влияе върху краткосрочната динамика на лихвените проценти по кредитите, като дългосрочното равновесие се възстановява сравнително бързо. Възстановяването на дългосрочното равновесие не се характеризира с асиметрия, а се осъществява с еднаква скорост, независимо от посоката на отклоненията. Според резултатите паричният трансмисионен механизъм в България се характеризира с относително силна реакция на лихвените проценти по корпоративните кредити към промените в монетарните условия в еврозоната. Сходството с еврозоната по отношение на първата фаза на паричния трансмисионен механизъм е показателно за съществуването на силна финансова интеграция със зоната на единната валута, което от своя страна е предпоставка за ефективното функциониране на механизма на паричен съвет, а при бъдещо членство в еврозоната и за ефективно провеждане на паричната политика в монетарния съюз.

Изложението е структурирано, както следва: в следващата част е направен преглед на основните изводи в литературата за реакцията на лихвените проценти по кредитите към измененията в лихвените нива на паричния пазар; третата част съдържа описание на източниците и основните характеристики на данните; в четвъртата част е разгледана дългосрочна зависимост, в която лихвените проценти по кредитите за предприятия са представени като функция на междубанковия лихвен процент в еврозоната и

кредитния риск в страната. Въз основа на тази дългосрочна връзка в част пета са оценени както стандартен модел с корекция на грешката, така и модифицирана спецификация, в която се допуска възможността придвижването към дългосрочното равновесие да се осъществява с различна скорост в зависимост от посоката на съответното отклонение. Накрая, в част шеста са обобщени изводите от изследването.

## Връзка между лихвения процент на паричния пазар и лихвените проценти по кредитите: основни изводи в литературата

Паричната политика оказва влияние върху икономическата активност и инфлацията посредством няколко канала, които в своята съвкупност представляват паричния трансмисионен механизъм. Това са каналите на лихвения процент, на валутния курс, каналът на цените на активите и кредитните канали (каналът на банковото кредитиране и широкият кредитен канал).[1] Познаването на паричния трансмисионен механизъм е изключително важно за централните банки от гледна точка на функцията им да провеждат паричната политика. Изследването на паричния трансмисионен механизъм е от значение и за страните с паричен режим, който изключва самостоятелна монетарна политика (какъвто е паричният съвет). При тях познаването на паричния трансмисионен механизъм е нужно, за да се оценят ефектите на външните монетарни импулси върху местната икономика.

Необходимостта да се изследва функционирането на паричния трансмисионен механизъм традиционно определя интереса към формирането на лихвените проценти в икономиката. По същество това е първата фаза на паричния трансмисионен механизъм. Централно място при изучаването на динамиката на лихвените проценти се отделя на степента и скоростта, с която измененията в лихвените проценти по инструментите на централната банка или лихвените нива на междубанковия паричен пазар се пренасят върху цените на предлаганите от банките продукти.

Изследванията за връзката между лихвения процент на паричния пазар и лихвените проценти по кредитите се характеризират с

[1] Egert и Macdonald (2006) предлагат обзор на литературата за различните канали на паричния трансмисионен механизъм в страните от Централна и Източна Европа.

голямо разнообразие по отношение на използваната методология и източници на данни. По-голямата част от изследванията си служат с агрегирани данни за банковата система в една или няколко страни, докато други изучават проблема на базата на данни за отделните банки. Обект на изследванията са широк кръг от лихвени проценти, които се различават както по отношение на кредитополучателя (предприятия или домакинства), така и по отношение на срочността на кредитите. Независимо от разнообразието на използваните в изследванията методи и източници на данни, прегледът на литературата дава възможност да се формулират няколко основни заключения.

Резултатите от изследванията показват, че съществува разлика между реакцията на лихвените проценти в краткосрочен и в дългосрочен план. За да се отчетат тези особености, като цяло преобладава практиката да се разграничава краткосрочна и дългосрочна връзка между разглежданите променливи, което се осъществява посредством ARDL модели (*autoregressive distributed lag models*) или модели с корекция на грешката. Обикновено краткосрочната реакция е непълна и бавна, докато в дългосрочен план степента на реакция се характеризира с по-високи стойности.

Наличието на слаба реакция при лихвените проценти по кредитите е обект на различни обяснения в литературата. Lowe и Rohling (1992) обобщават основните причини за съществуването на слаба реакция от теоретична гледна точка. Първо, причина за наличието на бавна и непълна реакция на лихвените проценти по кредитите може да е асиметричната информация между банките и длъжниците. В такива условия покачването на лихвените проценти по кредитите над определено ниво може да доведе до привличането на по-рискови длъжници (*adverse selection*) или предприемането на по-рискови проекти от страна на длъжниците (*moral hazard*). Тази влошена рискова структура на длъжниците и на предприетите от тях проекти би се отразила в по-ниска вероятност за обслужване на задълженията и съответно намаление на очакваната възвръщаемост, която банките получават по кредитите. За да избегнат тези отрицателни ефекти, банките биха предпочели да не повишават лихвените проценти по кредитите над определено ниво дори при увеличение на цената на привлечените ресурси, едновременно с което да въведат количествени ограничения в кредитната си дейност. При равни други условия това би се отразило в по-слаба реакция (във възходяща посока) на лихвените проценти по кредитите. Второ, причина за слаба реакция на

лихвените проценти може да бъде и наличието на дългосрочно взаимоотношение между банката и длъжника, което да се характеризира с поддържането на относително постоянни лихвени плащания. Допълнителни причини за слабата реакция на лихвените проценти на банките са съществуването на разходи за промяна на тарифите, несигурността относно бъдещото развитие на пазарните лихвени проценти и липсата на конкуренция. Степента и скоростта на реакцията зависят и от това, доколко промяната в лихвения процент на паричния пазар се възприема като трайна. Ако банките преценят, че тази промяна е временно явление, те могат да не предприемат изменения в лихвените си проценти.

Прегледът на литературата показва, че сред отделните страни има значителни различия в реакцията на лихвените проценти по кредитите към промените в лихвения процент на паричния пазар (Cottarelli и Kourelis,1994; Borio и Fritz, 1995; Mojon, 2000; Sørensen и Werner, 2006). Cottarelli и Kourelis (1994) изследват връзката между степента на реакция на лихвените проценти и особеностите на финансовия пазар. Техният анализ показва, че съществуват няколко фактора за по-силна реакция на лихвените проценти, сред които са наличието на паричен пазар за краткосрочни инструменти, ограничените колебания на лихвените проценти на паричния пазар и относително малките бариери пред навлизането на нови участници на финансовите пазари. Следвайки сходен подход, на базата на панелен модел за няколко от страните в еврозоната, Mojon (2000) също посочва, че различията сред страните по отношение на реакцията на лихвените проценти могат да се обяснят с особеностите на финансовата им структура. Високата степен на колебание на лихвения процент на паричния пазар ограничава реакцията на лихвените проценти по кредитите, а конкуренцията сред банките и от страна на директното финансиране принуждава банките да пренасят по-бързо понижения на лихвения процент на паричния пазар върху лихвените проценти по кредитите и съответно неговите повишения върху лихвените проценти по депозитите. Sørensen и Werner (2006) се опитват да обяснят различните реакции на лихвените проценти в страните от еврозоната (по-конкретно различията в скоростта, с която се възстановява дългосрочното равновесие) с макроикономически и финансови индикатори. Според получените от тях резултати най-важният фактор в това отношение е концентрацията в банковия сектор, докато останалите фактори, които разглеждат, са с по-малка значимост. Търсейки причините за различните реакции на

лихвените проценти в страните от еврозоната, Sander и Kleimeier (2003) също разглеждат група от макроикономически фактори и променливи, описващи банковата система. Техните резултати показват, че реакцията на лихвените проценти към паричната политика зависи от колебанията на лихвеното ниво на паричния пазар, инфлацията и степента на финансово развитие.

Toolsema, Sturm и de Haan (2002) разглеждат въпроса дали реакциите на лихвените проценти по кредитите в шест от страните в еврозоната са станали по-близки една до друга с течение на времето, т.е. дали е настъпила конвергенция в паричния трансмисионен механизъм. Важността на този въпрос произтича от факта, че ефективността на единната парична политика зависи от хомогенността на трансмисионния механизъм в отделните страни, формиращи паричния съюз. Според тях сред страните има различия както по отношение на краткосрочната, така и на дългосрочната реакция към инициираните от паричната политика промени в лихвеното равнище, въпреки че е налице известна конвергенция на трансмисията на паричната политика в отделните страни.

Редица изследвания разглеждат и въпроса за наличието на асиметрия в зависимост от посоката на изменение на лихвените проценти (Mojon, 2000, Sander и Kleimeier, 2000, 2003). Според резултатите от изследването на Mojon (2000) например пренасянето на измененията в лихвените проценти на паричния пазар върху цената на заемните ресурси в периоди на покачващи се лихвени нива е по-силно в сравнение с периоди на понижаващи се лихвени проценти.

Настоящото изследване има редица общи черти с литературата за моделирането на лихвените проценти по предлаганите от банките продукти. Например подобно на изследванията в тази област емпиричният анализ в настоящата разработка има за цел да измери степента и скоростта на реакция на лихвените проценти по кредитите, като разграничава краткосрочна и дългосрочна връзка между разглежданите променливи. Налице са обаче две основни различия в сравнение със споменатите в прегледа на литературата изследвания. Първата особеност е свързана с избора на индикатора за монетарните условия, спрямо измененията в който се измерва реакцията на лихвените проценти по кредитите. Вместо с лихвеното равнище на местния паричен пазар, тук е потърсена връзка с монетарните условия в еврозоната,

които са апроксимирани с лихвените проценти на паричния пазар в еврозоната. Причината за този избор е фактът, че в условията на паричен съвет и отсъствие на самостоятелна парична политика монетарните условия в страната се определят в голяма степен от монетарните условия в страната (зоната) на резервната валута. Изучаването на въпроса как лихвите в страната реагират на промените в монетарните условия в еврозоната би задълбочило разбирането за влиянието на външните лихвени проценти върху икономиката на страната и за функционирането на трансмисионния механизъм. Втората особеност на настоящото изследване е, че в него наред с монетарните условия е отчетена ролята и на кредитния риск като фактор при формирането на цената на заемните ресурси. Този въпрос заслужава внимание с оглед на значителните промени в икономическата конюнктура през последните години и започналото през 2008 г. отражение на глобалната финансова криза върху българската икономика.

## Източници и основни характеристики на данните

Настоящото изследване разглежда формирането на лихвените проценти по новоотпуснатите кредити за нефинансови предприятия в левове и евро. Източник на данните е лихвената статистика на БНБ, като оттам са използвани четири серии за лихвените проценти: по краткосрочни кредити в левове ($i_{BGN\_ST}$), по дългосрочни кредити в левове ($i_{BGN\_LT}$), по краткосрочни кредити в евро ($i_{EUR\_ST}$) и по дългосрочни кредити в евро ($i_{EUR\_LT}$). За да се осигурят максимално дълги редове, са използвани дефинициите в базата данни за лихвената статистика на БНБ до края на 2006 г., т.е. краткосрочни кредити са тези с оригинален матуритет до една година (без овърдрафт), а дългосрочни – с оригинален матуритет над една година. В допълнение са построени още две серии, които обобщават съответно динамиката на лихвените проценти по кредитите в левове ($i_{BGN}$) и в евро ($i_{EUR}$). Данните са месечни и покриват периода от началото на 1999 г. до края на 2009 г. В сериите не се наблюдава сезонност, поради което анализът е приложен спрямо оригиналните редове.

Графика 1 представя динамиката на отделните лихвени проценти по кредитите за предприятия заедно с тримесечния ЮРИБОР. Целта на тази съпоставка е да се провери визуално доколко лихвените проценти по кредитите следват измененията на лихвеното ниво по междубанковите депозити в еврозоната.

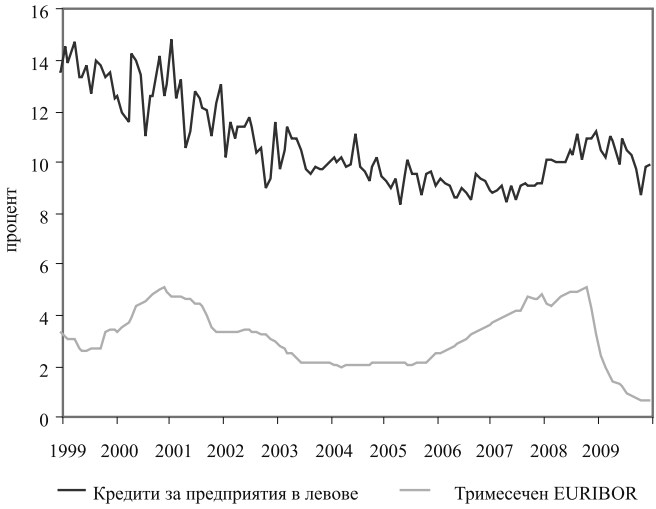
Тази връзка би трябвало да бъде относително силна, като се има предвид, че лихвените проценти по преобладаващата част от кредитите за предприятия се определят като сума от нивото на пазарен индекс (най-често ЮРИБОР) и надбавка. През по-голямата част от периода лихвените проценти по кредитите следват тенденциите в лихвеното ниво на междубанковия паричен пазар в еврозоната, като се потвърждават очакванията, че корелацията с тримесечния ЮРИБОР е по-силна при кредитите в евро. По-ясна представа за степента, в която лихвените проценти по кредитите следват тримесечния ЮРИБОР дава графика 2, където е показан спредът между тях. Този спред не е постоянен във времето, което означава, че динамиката на лихвените проценти по кредитите се определя и от други фактори, какъвто например може да бъде равнището на кредитния риск в икономиката.

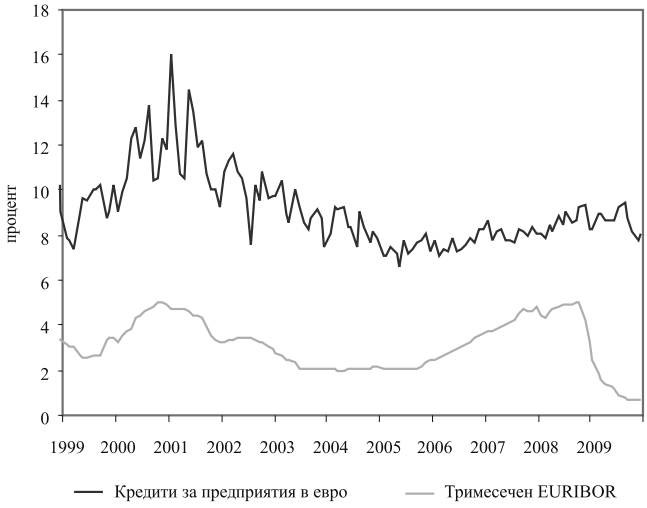
При моделирането на лихвените проценти по кредитите ролята на кредитния риск обикновено се игнорира, което вероятно е свързано и с проблема за неговото измерване. В настоящото изследване е направен опит кредитният риск да се включи като фактор за цената на заемните ресурси, като за целта неговото равнище е апроксимирано на базата на конюнктурните условия в икономиката. Изхождайки от допускането, че кредитният риск нараства при влошаване на бизнес климата и се понижава при неговото подобряване, равнището на кредитния риск е измерено с индикатора на НСИ за бизнес климата в промишлеността, взет с обратен знак.[2] На графика 2 динамиката на спреда между лихвените проценти по кредитите и тримесечния ЮРИБОР е съпоставена с така построения индикатор за кредитния риск. Като цяло двата показателя се характеризират с общи тенденции: намаление през по-голямата част от периода, свързано с благоприятната макроикономическа конюнктура до 2008 г., и рязко нарастване в края на разглеждания период вследствие на влошените поради глобалната финансова криза условия.

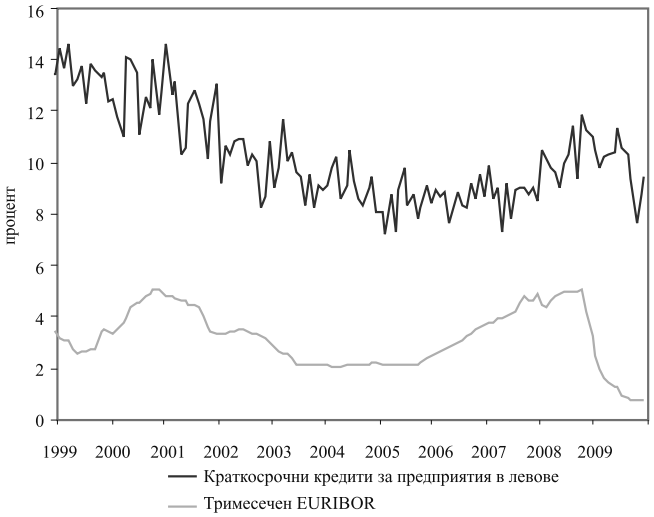
[2] Въпреки че в случая по-релевантно би било да се използва общият индекс за бизнес климата в икономиката, това не е направено, тъй като в него секторът на услугите присъства едва от 2002 г.

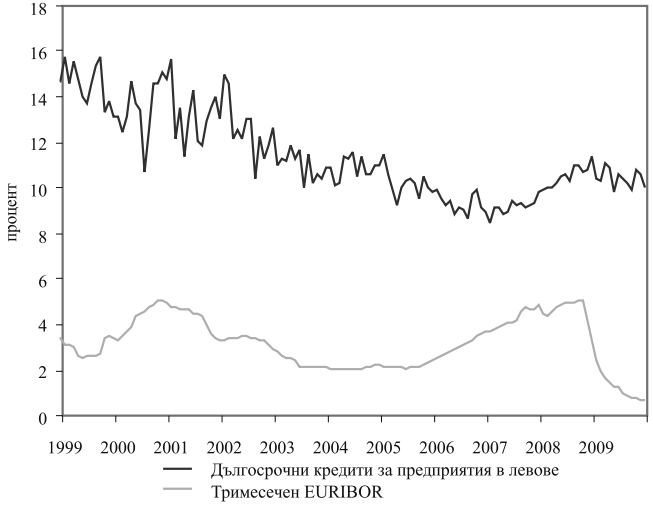
Графика 1

**ЛИХВЕНИ ПРОЦЕНТИ ПО КРЕДИТИТЕ И ТРИМЕСЕЧЕН ЮРИБОР**




16
14
12
10
8
6
4
2
0
процент
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Краткосрочни кредити за предприятия в левове
Тримесечен EURIBOR


18
16
14
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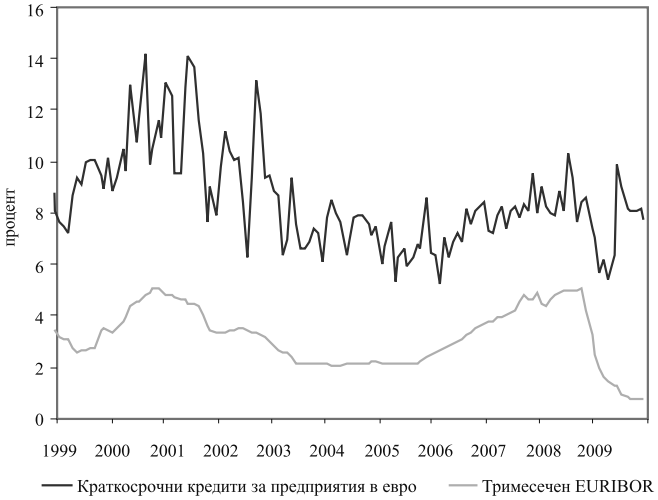
10
8
6
4
2
0
процент
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Дългосрочни кредити за предприятия в левове
Тримесечен EURIBOR


16
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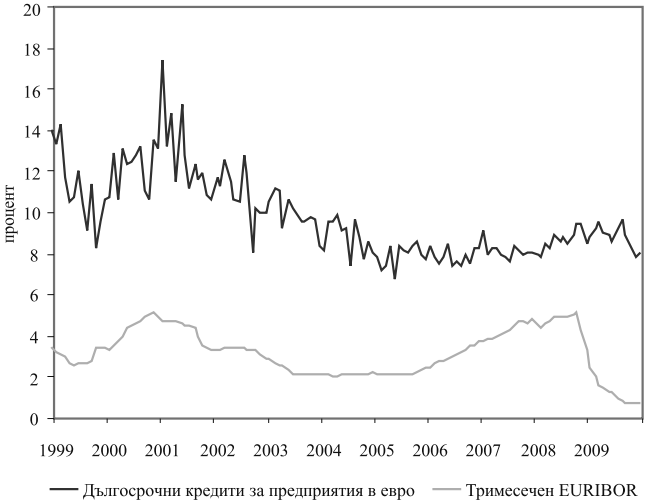
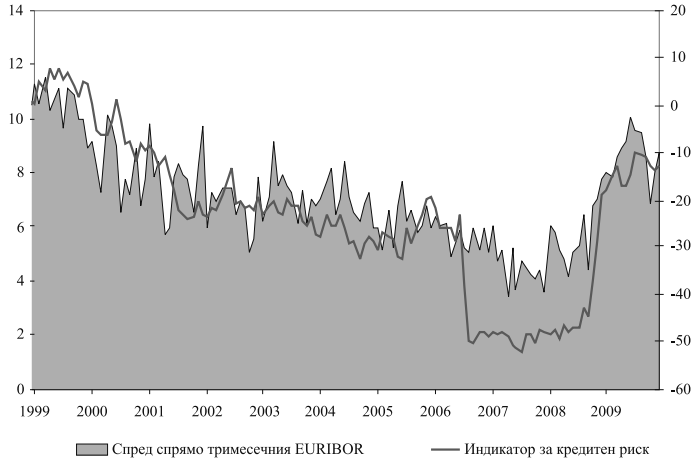
процент
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Краткосрочни кредити за предприятия в евро
Тримесечен EURIBOR


20
18
16
14
12
10
8
6
4
2
0
процент
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Дългосрочни кредити за предприятия в евро
Тримесечен EURIBOR

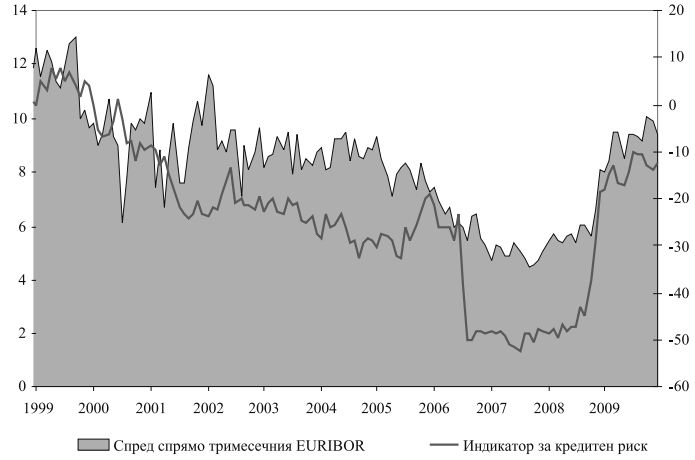
Графика 2

## СПРЕДОВЕ НА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ СПРЯМО ТРИМЕСЕЧНИЯ ЮРИБОР И ДИНАМИКА НА ИНДИКАТОРА ЗА КРЕДИТЕН РИСК

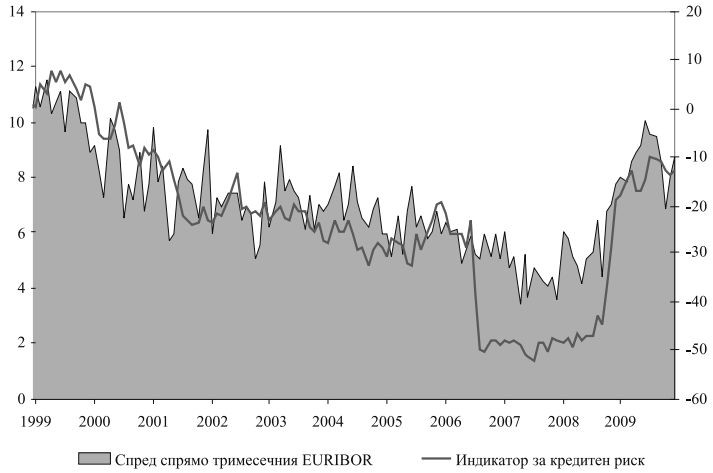

**Краткосрочни кредити за предприятия в левове**



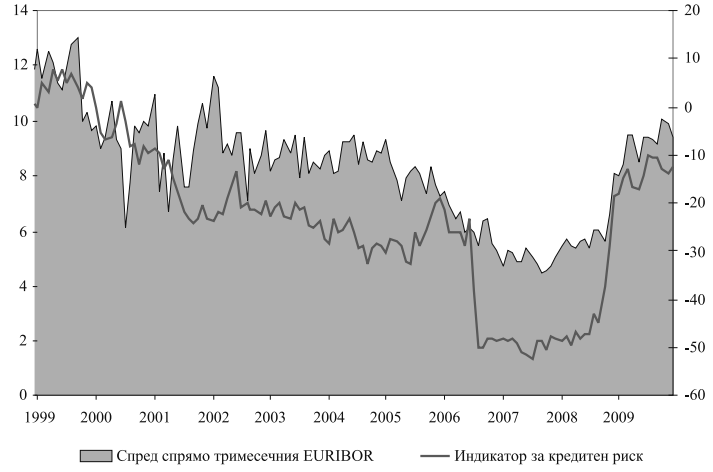

**Дългосрочни кредити за предприятия в левове**



**Краткосрочни кредити за предприятия в левове**




**Дългосрочни кредити за предприятия в левове**



Преди да се пристъпи към моделирането на лихвените проценти по кредитите, първо трябва да се установят статистическите характеристики на използваните серии. Най-напред е необходимо да се провери дали променливите са стационарни. В таблица 1 са представени резултатите от Augmented Dickey-Fuller (ADF) теста за стационарност на променливите, откъдето се вижда, че всички разглеждани серии са интегрирани от първи ред. Нулевата хипотеза за наличие на единичен корен не може да бъде отхвърлена за нивата на променливите, но се отхвърля при прилагането на ADF–теста към първите им разлики.

Таблица 1

**ADF ТЕСТ ЗА ЕДИНИЧЕН КОРЕН**

| Променлива | Нива | | Първи разлики | | Степен на интеграция |
|---|---|---|---|---|---|
| | Лагове | ADF статистика | Лагове | ADF статистика | |
| $i_{BGN}$ | 4 | -1.60 | 3 | -10.03*** | I(1) |
| $i_{EUR}$ | 3 | -0.32 | 2 | -10.19*** | I(1) |
| $i_{BGN\_ST}$ | 4 | -1.38 | 3 | -9.21*** | I(1) |
| $i_{BGN\_LT}$ | 4 | -1.39 | 3 | -9.35*** | I(1) |
| $i_{EUR\_ST}$ | 4 | -0.46 | 3 | -9.06*** | I(1) |
| $i_{EUR\_LT}$ | 1 | -1.22 | 2 | -10.31*** | I(1) |
| R | 1 | -0.99 | 0 | -5.18*** | I(1) |
| Risk | 0 | -0.60 | 0 | -10.49*** | I(1) |

Нулевата хипотеза е за наличие на единичен корен. *** означава отхвърляне на нулевата хипотеза при ниво на значимост 1%. Спецификацията не включва константа или тренд. Броят на лаговете е избран на базата на Schwarz Info Crirterion.

За да се провери устойчивостта на тези изводи беше приложен и тест за единичен корен, в който нулевата хипотеза предполага стационарност на изследваната променлива. В таблица 2 са представени резултатите от Kwiatkowski–Phillips–Schmidt–Shin (KPSS) тест за стационарност. Като цяло KPSS тестът потвърждава заключенията относно степента на интегрираност на променливите, като единственото изключение е тримесечният ЮРИБОР (според KPSS теста тази променлива е стационарна).

Таблица 2

**KPSS ТЕСТ ЗА ЕДИНИЧЕН КОРЕН**

| Променлива | LM статистика | | Степен на интеграция |
|---|---|---|---|
| | Нива | Първи разлики | |
| $i_{BGN}$ | 1.04*** | 0.32 | I(1) |
| $i_{EUR}$ | 0.74** | 0.20 | I(1) |
| $i_{BGN\_ST}$ | 0.91*** | 0.28 | I(1) |
| $i_{BGN\_LT}$ | 1.18*** | 0.33 | I(1) |
| $i_{EUR\_ST}$ | 0.68** | 0.17 | I(1) |
| $i_{EUR\_LT}$ | 1.05*** | 0.09 | I(1) |
| r | 0.16 | 0.16 | I(0) |
| risk | 0.81*** | 0.29 | I(1) |

Нулевата хипотеза е, че съответната променлива е стационарна. ***/**/* означава отхвърляне на нулевата хипотеза при ниво на значимост съответно 1%, 5% и 10%.

Следващата стъпка е да се провери дали сериите са коинтегрирани, т.е. дали съществува линейна комбинация между нестационарните серии, която да е стационарна. За целта изследването използва теста за коинтеграция, предложен от Engle и Granger (1987). Същността му се изразява в оценяването на регресия между разглежданите променливи и тестването на остатъците от нея за стационарност. Ако остатъците са стационарни, това означава, че съществува коинтеграционна връзка между разглежданите променливи.

Следвайки тази стратегия, лихвените проценти по кредитите са представени като функция на тримесечния ЮРИБОР и индикатора за кредитен риск. Резултатите от тестовете за коинтеграция са обобщени в таблица 3. Остатъците от регресиите за отделните лихвени проценти по кредитите са стационарни, от което следва, че променливите са коинтегрирани.

Таблица 3

**ENGLE–GRANGER ТЕСТ ЗА КОИНТЕГРАЦИЯ МЕЖДУ ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ, ЮРИБОР И ИНДИКАТОРА ЗА КРЕДИТЕН РИСК**

Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion

| | tau-statistic | Prob.* | z-statistic | Prob.* |
|---|---|---|---|---|
| $i_{BGN}$ | -8.20 | 0.0000 | -86.63 | 0.0000 |
| $i_{EUR}$ | -5.93 | 0.0000 | -53.08 | 0.0001 |
| $i_{BGN\_ST}$ | -8.63 | 0.0000 | -93.40 | 0.0000 |
| $i_{BGN\_LT}$ | -6.46 | 0.0000 | -61.93 | 0.0000 |
| $i_{EUR\_ST}$ | -6.65 | 0.0000 | -65.62 | 0.0000 |
| $i_{EUR\_LT}$ | -4.59 | 0.0057 | -40.47 | 0.0015 |

* MacKinnon (1996) p-values

## Дългосрочна зависимост

След като беше установено, че използваните серии са нестационарни и коинтегрирани, тази част на изследването има за цел да разгледа дългосрочната зависимост между тях. Лихвените проценти по кредитите са представени като функция на тримесечния ЮРИБОР и индикатора за кредитен риск:

$$i_t = c + \beta r_t + \lambda risk_t + u_t \quad (1)$$

където $i_t$ представлява съответния лихвен процент по кредитите, $r_t$ е тримесечния ЮРИБОР, а $risk_t$ е индикаторът за кредитен риск. Особен интерес представлява коефициентът β, който отразява дългосрочната реакция на съответния лихвен процент по кредитите към промяна в тримесечния ЮРИБОР. Например, ако β = 1, това означава, че е налице пълно пренасяне на промените в лихвеното ниво на паричния пазар в еврозоната към лихвения процент по кредитите. Стойности под единица говорят съответно за частична реакция спрямо измененията в лихвеното ниво по междубанковите депозити в еврозоната.

В таблица 4 са представени резултатите от оценката на уравненията, откъдето се вижда, че в дългосрочен план

лихвените проценти по кредитите зависят от лихвеното ниво по междубанковите депозити в еврозоната и равнището на кредитния риск в страната. Резултатите от оценката на дългосрочната зависимост дават основание да се формулират две основни заключения. Първо, налице е разлика в дългосрочната реакция по отношение на оригиналния матуритет на кредитите, като реакцията е по-силна при кредитите с матуритет до една година. Второ, реакцията спрямо измененията в ЮРИБОР е по-силна при кредитите в евро. В дългосрочен план един процентен пункт увеличение на лихвеното ниво на паричния пазар в еврозоната води до 84 б.т. нарастване на лихвения процент по кредитите в евро и до повишение със 71 б.т. по кредитите в левове. Резултатите от Wald test за $\beta = 1$ показват, че хипотезата за пълно пренасяне в дългосрочен план не може да бъде отхвърлена за кредитите в евро при ниво на значимост 5%, докато данните отхвърлят хипотезата за $\beta = 1$ при левовите кредити. Последното вероятно е свързано със слабата реакция на лихвените проценти по дългосрочните левови кредити, които се характеризират и с най-ниска стойност на дългосрочна реакция спрямо измененията в лихвеното ниво по междубанковите депозити в еврозоната (0.68). Въпреки това може да се направи изводът, че като цяло паричният трансмисионен механизъм у нас се характеризира със значително влияние на измененията в монетарните условия в еврозоната върху дългосрочната динамика на местните лихвени проценти по кредитите.

Таблица 4

**ДЪЛГОСРОЧНА ВРЪЗКА МЕЖДУ ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ, ЮРИБОР И ИНДИКАТОРА ЗА КРЕДИТЕН РИСК**

| | $i_{BGN}$ | $i_{EUR}$ | $i_{BGN\_ST}$ | $i_{BGN\_LT}$ | $i_{EUR\_ST}$ | $i_{EUR\_LT}$ |
|---|---|---|---|---|---|---|
| Const | 10.50*** | 7.91*** | 9.70*** | 11.56*** | 6.40*** | 8.95*** |
| | (49.4) | (25.4) | (36.5) | (42.1) | (17.7) | (26.9) |
| r | 0.71*** | 0.84*** | 0.87*** | 0.68*** | 1.08*** | 0.91*** |
| | (11.3) | (9.1) | (11.0) | (8.4) | (10.1) | (9.2) |
| risk | 0.09*** | 0.06*** | 0.09*** | 0.10*** | 0.06*** | 0.09*** |
| | (19.4) | (9.3) | (16.3) | (16.9) | (7.3) | (12.5) |
| Wald test $\beta = 1$ | | | | | | |
| F-statistic | 20.66 | 2.82 | 2.77 | 15.15 | 0.59 | 0.87 |
| Prob. | 0.0000 | 0.0957 | 0.0986 | 0.0002 | 0.4435 | 0.3516 |

В скобите са посочени съответните t-статистки. С ***/**/* са означени съответно статистическа значимост при 1%, 5% и 10%.

## Модел с корекция на грешката

На базата на оценената дългосрочна зависимост, в тази част на изследването са построени два модела с корекция на грешката. Първият модел е стандартен и има вида:

$$\Delta i_t = \sum_{j=1}^{p} \gamma_j \Delta i_{t-j} + \sum_{k=0}^{q} \delta_k \Delta r_{t-k} + \sum_{l=0}^{s} \varphi_{t-l} \Delta risk_{t-l} + \alpha ECT_{t-1} + \varepsilon_t \quad (2)$$

където $ECT_t = i_t - \beta r_t - \lambda risk_t - c$

и $i_t$ представлява съответния лихвен процент по кредитите, $r_t$ е тримесечния ЮРИБОР, а $risk_t$ е индикаторът за кредитен риск.

Вторият модел допуска придвижването към дългосрочното равновесие да се осъществява с различна скорост в зависимост от това, дали лихвеният процент по кредитите се намира над или под равновесното равнище, зададено от дългосрочната зависимост между променливите. Асиметричният модел може да се представи по следния начин:

$$\Delta i_t = \sum_{j=1}^{p} \gamma_j \Delta i_{t-j} + \sum_{k=0}^{q} \delta_k \Delta r_{t-k} + \sum_{l=0}^{s} \varphi_{t-l} \Delta risk_{t-l} + \alpha_1 ECT_{t-1}^{+} + \alpha_2 ECT_{t-1}^{-} + \varepsilon_t \quad (3),$$

където

$$\begin{cases} ECT_t^{+} = ECT_t, \text{ ако } ECT_t > 0 \\ ECT_t^{+} = 0, \text{ ако } ECT_t \le 0 \end{cases}$$

и

$$\begin{cases} ECT_t^{-} = ECT_t, \text{ ако } ECT_t \le 0 \\ ECT_t^{-} = 0, \text{ ако } ECT_t > 0 \end{cases}$$

$\alpha_1$ и $\alpha_2$ отразяват скоростта на придвижване към дългосрочното равновесие, когато лихвеният процент по кредитите се намира над, съответно под него.

В таблица 5 са представени резултатите от оценяването на стандартния модел с корекция на грешката. При оценяването на

зависимостите първоначално беше използвана по-обща лагова структура, след което незначимите лагове бяха изключени от съответната спецификация. Резултатите показват, че придвижването към дългосрочното равновесие влияе върху краткосрочната динамика на лихвените проценти по кредитите, като отклоненията от дългосрочното равновесие се възстановяват относително бързо. Коефициентът α е статистически значим във всички уравнения и варира от -0.34 за дългосрочните кредити в левове до -0.60 за краткосрочните кредити в левове. Лихвеното ниво по междубанковите депозити в еврозоната е изключено от краткосрочната динамика, тъй като не е статистически значим фактор при нито една от спецификациите. В краткосрочен план индикаторът за кредитен риск оказва влияние върху лихвените проценти по левовите кредити, но неговият коефициент не е статистически значим в уравненията за лихвените проценти по кредитите в евро. В краткосрочната динамика лихвените проценти по кредитите участват с отрицателен знак, като изключение прави само лихвеният процент по краткосрочните кредити в евро (неговият коефициент е положителен, но не е статистически значим).

Таблица 5

**БАЗИСЕН МОДЕЛ С КОРЕКЦИЯ НА ГРЕШКАТА**

| | $i_{BGN}$ | $i_{EUR}$ | $i_{BGN\_ST}$ | $i_{BGN\_LT}$ | $i_{EUR\_ST}$ | $i_{EUR\_LT}$ |
|---|---|---|---|---|---|---|
| $ECT_{t-1}$ | -0.53*** | -0.40*** | -0.60*** | -0.34*** | -0.54*** | -0.41*** |
| | (-5.21) | (-5.31) | (-5.63) | (-4.12) | (-6.14) | (-5.00) |
| $\Delta i_{t-1}$ | -0.15* | -0.10 | -0.16* | -0.18** | 0.08 | -0.31*** |
| | (-1.70) | (-1.17) | (-1.82) | (-2.06) | (0.95) | (-3.85) |
| $\Delta risk_t$ | 0.05** | 0.03 | 0.06** | 0.04* | 0.00 | 0.01 |
| | (2.58) | (1.14) | (2.53) | (1.78) | (0.02) | (0.41) |
| Adj. R-squared | 0.31 | 0.23 | 0.35 | 0.22 | 0.24 | 0.37 |
| S.E. of regression | 0.72 | 0.89 | 0.93 | 0.83 | 1.17 | 1.01 |
| DW stat | 2.00 | 2.05 | 2.00 | 1.98 | 2.01 | 2.01 |

В скобите са посочени t-статистики. С ***/**/* са означени съответно статистическа значимост при 1%, 5% и 10%.

Таблица 6

**АСИМЕТРИЧЕН МОДЕЛ С КОРЕКЦИЯ НА ГРЕШКАТА**

| | $i_{BGN}$ | $i_{EUR}$ | $i_{BGN\_ST}$ | $i_{BGN\_LT}$ | $i_{EUR\_ST}$ | $i_{EUR\_LT}$ |
|---|---|---|---|---|---|---|
| $ECT^{+}_{t-1}$ | -0.65*** | -0.45*** | -0.65*** | -0.40*** | -0.52*** | -0.50*** |
| | (-4.69) | (-4.62) | (-4.74) | (-3.82) | (-4.87) | (-4.72) |
| $ECT^{-}_{t-1}$ | -0.44*** | -0.33*** | -0.55*** | -0.27** | -0.58*** | -0.31*** |
| | (-3.51) | (-3.02) | (-4.11) | (-2.28) | (-4.36) | (-2.76) |
| $\Delta i_{t-1}$ | -0.15* | -0.09 | -0.16* | -0.19** | 0.09 | -0.30*** |
| | (-1.66) | (-1.05) | (-1.82) | (-2.17) | (0.96) | (-3.78) |
| $\Delta$ $risk_t$ | 0.05** | 0.02 | 0.06** | 0.04 | 0.00 | 0.01 |
| | (2.37) | (1.04) | (2.48) | (1.58) | (0.03) | (0.28) |
| Adj. R-squared | 0.31 | 0.23 | 0.35 | 0.22 | 0.24 | 0.37 |
| S.E. of regression | 0.72 | 0.89 | 0.93 | 0.83 | 1.18 | 1.01 |
| DW stat | 1.98 | 2.05 | 1.99 | 1.98 | 2.01 | 2.03 |
| Wald test $\alpha^{+} = \alpha^{-}$ | | | | | | |
| F-statistic | 1.48 | 0.71 | 0.37 | 0.90 | 0.11 | 1.84 |
| Prob. | 0.2255 | 0.3999 | 0.5443 | 0.3444 | 0.7394 | 0.1771 |

В скобите са посочени t-статистики. С ***/**/* са означени съответно статистическа значимост при 1%, 5% и 10%.

Резултатите от оценката на асиметричния модел с корекция на грешката са обобщени в таблица 6.[3] Коефициентите $\alpha_1$ и $\alpha_2$, които отразяват скоростта на възстановяване на дългосрочното равновесие, са значими във всички уравнения и се характеризират със сравнително високи стойности. Резултатите показват, че хипотезата за равенство между $\alpha_1$ и $\alpha_2$ не може да бъде отхвърлена. Това означава, че възстановяването на дългосрочното равновесие се осъществява с еднаква скорост, независимо от посоката на съответното отклонение. Индикаторът за кредитен риск оказва влияние върху краткосрочната динамика на левовите кредити с матуритет до една година, докато неговият коефициент не е значим в уравненията за останалите лихвени проценти. В

[3] Както и при стандартния модел с корекция на грешката, първоначално беше използвана по-обща лагова структура, след което незначимите лагове бяха изключени от спецификацията.

краткосрочната динамика лихвените проценти по кредитите участват по сходен начин с резултатите от стандартния модел с корекция на грешката.

## Заключение

В това изследване е направен опит да се проучат възможностите за моделиране на лихвените проценти по кредитите за предприятия, като е направено разграничение по отношение на оригиналния матуритет и валутата на новоотпуснатите кредити. Използвана е рамката на моделите с корекция на грешката, което дава възможност да се анализират както дългосрочната зависимост, така и краткосрочната динамика на променливите.

Предложеният в настоящото изследване подход за моделиране на лихвените проценти по корпоративните кредити се различава от този в стандартните изследвания главно в две отношения. Първо, като фактор за определянето на лихвените проценти по кредитите е включен и индикатор за кредитния риск в икономиката, което е наложително в условията на съществена промяна на макроикономическата среда. Второ, за разлика от стандартните модели, които обвързват лихвените проценти по кредитите с паричната политика на централната банка и нейното отражение върху междубанковия паричен пазар, настоящото изследване предлага модел, който е приложим в условията на паричен съвет. Централно място в анализа е отделено на въпроса как промените в лихвеното ниво по междубанковите депозити в еврозоната се пренасят върху лихвените проценти по кредитите за предприятия. По този начин могат да се направят изводи за характеристиките на паричния трансмисионен механизъм в България и по-конкретно за отражението на паричната политика в еврозоната върху монетарните условия в страната.

Резултатите могат да се обобщят, както следва. Наред с лихвеното ниво по междубанковите депозити в еврозоната, равнището на кредитния риск също е значим фактор за динамиката на лихвените проценти по кредитите за предприятия, което се проявява главно в дългосрочен план. Дългосрочната реакция спрямо измененията на монетарните условия в еврозоната се характеризира с особености по отношение на матуритета и валутата на кредитите, като тя е по-висока при кредитите с матуритет до една година и при кредитите в

евро. Придвижването към дългосрочното равновесие влияе върху краткосрочната динамика на лихвените проценти по кредитите. Дългосрочното равновесие се възстановява относително бързо, като този процес не се характеризира с асиметрия, т.е. той се осъществява с еднаква скорост, независимо от посоката на съответното отклонение.

Въз основа на резултатите може да се направи изводът, че паричният трансмисионен механизъм в България се характеризира със силна реакция на лихвените проценти по корпоративните кредити към измененията на монетарните условия в еврозоната. При корпоративните кредити в евро силната връзка с лихвения процент на междубанковия паричен пазар в еврозоната произтича от широкото използване на ЮРИБОР като компонент за определяне на лихвените проценти по тези кредити. Макар и малко по-слаба, съществена е реакцията и на лихвените проценти по корпоративните левови кредити, което показва, че е налице значително влияние от страна на монетарните условия в зоната на единната валута. Сходството с еврозоната по отношение на първата фаза на паричния трансмисионен механизъм е показателно за съществуването на силна финансова интеграция със зоната на единната валута, което от своя страна е предпоставка за ефективното функциониране на механизма на паричен съвет, а при бъдещо членство в еврозоната и за ефективно провеждане на паричната политика в монетарния съюз.

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# Влияние на глобалната икономическа криза върху процеса на присъединяване на България към еврозоната

Цветелина Маринова

Резюме. Настоящото изследване е фокусирано върху актуален и значим проблем на европейската интеграция на България, свързан с подготовката за пълноправно членство в Икономическия и паричен съюз. Динамиката и сериозността на процесите, протичащи в страната, в еврозоната и в целия Европейски съюз в периода на глобална икономическа криза, пораждат необходимост от анализиране както на постигнатите преди кризата резултати при подготовката, така и на изпитанията и възможностите, пред които е изправена страната понастоящем. Основна теза на изследването е, че световната икономическа криза оказва силно влияние върху процеса на подготовка на всички държави от Централна и Източна Европа за членство в еврозоната. Естония е първата страна с режим на паричен съвет, приемаща еврото, и то в условията на икономическа криза и изключително тежък за Съюза период. Това показва, че номиналната конвергенция е постижима от държави с фиксиран валутен режим. Основните изпитания пред България са свързани с поддържането на макроикономическата и фискалната стабилност, за да се осигури устойчив процес на наваксване и сближаване. Кризата влияе както върху развитието на местната и европейската икономика, така и върху позициите на европейските институции и консенсуса в държавите членки относно приемането на нови държави в еврозоната. Тя обаче предоставя и възможности за покриване на част от критериите за приемане на еврото, които преди това бяха трудно постижими за България. Най-важното предизвикателство, но също и възможност, представлява промяната на модела на икономическо развитие през следващите години, чиято роля за изпълнение на критериите за членство в еврозоната ще бъде определяща.

Abstract. The present study focuses on the current and significant issue of the European integration of Bulgaria related to its preparation for full membership in the European Economic and Monetary Union. The dynamics and seriousness of the processes taking place in the country, the eurozone and across the European Union in the context of the global economic crisis have evoked the necessity to study their pre-crisis results in the preparation and the current challenges and opportunities to them. We argue that the global economic crisis has a strong impact on the accession of all the countries of Central and Eastern Europe to the eurozone. Estonia is the first country with a currency board to adopt the euro during the economic crisis and in an extremely difficult conditions in the Union. This indicates that nominal convergence can be achieved by countries with fixed exchange rate. The main challenges to Bulgaria are related to maintaining macroeconomic and fiscal stability in order to ensure a steady process of catching up and convergence. The crisis has affected both the development of the local and European economy, as well as the positions of the European institutions and the consensus in the Member States on the admission of new countries to the eurozone. However, it has also provided opportunities to fulfill some of the criteria for adopting the euro, which were difficult to achieve before. The most important challenge, but also an opportunity, is the change of the model of economic development in the coming years, whose role in meeting the criteria for eurozone membership will be decisive.

# Съдържание

Авторът е докторант към катедра „Международни отношения" на Университета за национално и световно стопанство – София. Темата е разработена от нея като стипендиант на БНБ за 2010 г. по Програмата за стипендианти на БНБ.

## Въведение

В периода след постигането на основния външнополитически приоритет на България за присъединяване към Европейския съюз (ЕС) във водеща стратегическа цел се превърна пълноправното членство в Икономическия и паричен съюз (ИПС). Съгласно договорите за присъединяване на дванайсетте нови държави-членки от датата на членството си в ЕС те участват в ИПС като държави с дерогация, които обаче са задължени да приемат общата европейска валута. Конкретни срокове за въвеждане на еврото не са определени и не може да има, тъй като това е свързано с постигането на Маастрихтските критерии[1]. Пълноправното членство в ИПС създава предпоставки за социално-икономическото развитие на държавите главно чрез поддържане на ценовата стабилност, стимулиране сближаването на доходите и ценовите равнища, задълбочаване на търговската, икономическата и финансовата интеграция с ЕС, осигуряване на по-голяма защита при възникването на финансови кризи.

Продължаващият процес на подготовка за присъединяване на България и още седем държави от Централна и Източна Европа (ЦИЕ) към еврозоната съвпадна с появата и разпространението на най-тежката финансова и икономическа криза в глобален мащаб след периода на Голямата депресия, която оказа много силно негативно влияние върху всички национални стопанства, изправяйки ги пред огромни изпитания. Световната икономическа криза представлява сериозен тест за устойчивостта на икономиките на страните към външни шокове, както и за степента на тяхната конвергенция. Години наред създаденият европейски модел на икономическо развитие бе притегателна сила за държавите, но дълбочината на настоящата криза доказва, че този модел е доста уязвим. Преди началото на икономическата криза България, както и другите държави от ЦИЕ положиха значителни усилия, за да изпълнят критериите за членство в еврозоната, и като цяло постигнаха добри резултати, а понастоящем трябва да се справят с още по-големи трудности. Някои от предизвикателствата са общи за всички държави от региона, а други са специфични и предопределени от особеностите на националните икономики, финансовите системи и от ефектите на кризата върху тях.

[1] Договор за ЕС (Договор от Маастрихт), подписан на 7 февруари1992 г., в сила от 1 ноември 1993 г.

Допълнително негативно влияние върху процеса на подготовка на държавите за приемане на еврото оказват дълговата криза и кризата в управлението на еврозоната. Те коренно промениха ситуацията в самата еврозона и силно рефлектираха върху доверието в еврото. Политическият консенсус относно разширяването на еврозоната ерозира, а процесът ще продължи едва след като бъдат решени настоящите проблеми. Приемането на България (и на другите държави от ЦИЕ) зависи в много голяма степен от изхода от кризата и възстановяването на икономиките в еврозоната.

България е малка и отворена икономика в преход, която, макар и с известно закъснение, бе сериозно засегната от глобалната икономическа криза и продължава да бъде изложена на рискове и заплахи, произтичащи както от външната, така и от вътрешната икономическа среда. Преди кризата страната изпълняваше почти всички критерии за приемане на еврото, с изключение на този за ценова стабилност, а понастоящем покрива само критерия за публичния дълг. Напредъкът, постигнат в подготовката за членство в еврозоната, бе естествен резултат от динамичния и висок растеж на националната икономика, който стимулира процеса на номинално и реално сближаване с ЕС. Моделът на икономическо развитие преди кризата обаче доведе до натрупването на значителни вътрешни и външни макроикономически дисбаланси, а това направи страната уязвима към външни шокове.

Настоящото изследване има за цел да представи основните предизвикателства и възможности за присъединяването на България към еврозоната в условията на продължаваща икономическа криза и при отчитане рисковете и заплахите, произтичащи от икономическата и политическата ситуация в еврозоната и ЕС. Ще бъде направена оценка на степента на готовност на страната за приемане на еврото в периода преди и по време на кризата. Постигнатите до момента резултати в изпълнението на критериите за членство в еврозоната ще бъдат съпоставени с тези в останалите държави от ЦИЕ – кандидатки за приемане на еврото.

Основните изпитания са свързани с поддържане на макроикономическата и фискалната стабилност в страната, което налага преодоляването на вътрешните и външните дисбаланси посредством извършването на структурни реформи в редица сектори, привличането на капитал в страната, запазването

стабилността на финансовата система, нарастването на производителността на труда. Ключова предпоставка за излизане на икономиката от рецесията и за бъдещото ѝ устойчиво развитие представлява смяната на модела на растеж – от модел, основан на местно търсене, свръхликвидност и обилно финансиране, към модел, ориентиран към външно търсене, износ и по-консервативни местни икономически агенти.

Ефектите на икономическата криза създават благоприятни предпоставки за постигане на критерия за ценова стабилност и значително подобряване на състоянието на платежния баланс. Кризата предоставя възможности и за българските институции да докажат, че провеждането на стриктна и благоразумна бюджетна политика може да доведе до навременно и адекватно справяне с проблемите със свръхдефицита в бюджета, което би повишило доверието и на европейските в националните институции и би ускорило присъединяването към еврозоната.

## I. Оценка на степента на готовност за присъединяване към еврозоната

### *1. Номинална конвергенция (Маастрихтски критерии)*

1.1. Ценова стабилност

В периода след присъединяването на България към ЕС до началото на световната финансова и икономическа криза (втората половина на 2008 г.) изпълнението на критерия за ценова стабилност бе основен проблем в процеса на подготовка за приемане на еврото.

Режимът на паричен съвет (ПС) създаде предпоставки за елиминиране на монетарните източници на инфлация и възстановяване доверието в националната валута, а по-голямата прозрачност и предсказуемост на паричната политика формираха по-рационални очаквания на икономическите агенти и повишиха доверието в местната икономика. Правилата и принципите на ПС налагат инфлационна дисциплина чрез фиксирането на курса към валута на зона с ниска инфлация, но това не означава автоматично изравняване на равнището на инфлацията в приемащата страна с това в резервната зона (еврозоната). Основен недостатък на ПС е, че дава възможност за пряко пренасяне на промените в цените на вносните стоки от еврозоната, което силно влияе за ускоряване

темпа на инфлацията в страната в периоди на растеж. При икономически спад обаче цените на стоките на световния пазар се понижават, а това благоприятства низходящата тенденция в ценовата динамика на вътрешния пазар.

През последното десетилетие инфлацията на потребителските цени в България показва значителни колебания, а средната ѝ стойност бе 6.7%, надвишаваща повече от два пъти тази в еврозоната.

Таблица 1

**ГОДИШНО ПРОЦЕНТНО ИЗМЕНЕНИЕ НА ХИПЦ-ИНФЛАЦИЯТА В ЕВРОЗОНАТА И БЪЛГАРИЯ И ИНФЛАЦИОНЕН ДИФЕРЕНЦИАЛ**

(%)

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Еврозона (16)** | 2.2 | 2.4 | 2.3 | 2.1 | 2.2 | 2.2 | 2.2 | 2.1 | 3.3 | 0.3 |
| **България** | 10.3 | 7.4 | 5.8 | 2.3 | 6.1 | 6.0 | 7.4 | 7.6 | 12.0 | 2.5 |
| **Инфлационен диференциал** | 8.1 | 5.0 | 3.5 | 0.2 | 3.9 | 4.2 | 5.2 | 5.5 | 8.7 | 2.2 |

Източници: Евростат, собствени изчисления.

След 2004 г. бързото нарастване на цените в България бе резултат най-вече от процеса на икономическа интеграция на страната в ЕС, модела на икономически растеж и паричния режим. Икономическата интеграция способства за реалната конвергенция чрез т.нар. ефект Баласа–Самюелсън, или „двойна инфлация". Това е феномен, наблюдаван единствено в икономиките, намиращи се в процес на сближаване на ценовите равнища, а основна причина са разликите в производителността на труда между тях и развитите държави. Някои автори твърдят, че в периода 1995–2008 г. този ефект явно се проявява в държавите от ЦИЕ, като 25% от инфлационния диференциал между новите държави от ЕС и еврозоната и 50% от местните инфлационни различия в търгуемия и нетъргуемия сектор могат да бъдат обяснени с него. Ефектът обаче постоянно намалява, особено след присъединяването към ЕС, а основна причина е напредъкът в процеса на реална конвергенция.

Други пък твърдят, че ефектът Баласа–Самюелсън не е бил водещ инфлационен фактор през периода нито в старите, нито в новите държави-членки[2].

Моделът на икономическо развитие на България през последните години имаше съществено влияние върху инфлационната динамика. България се превърна в атрактивно място за чужди инвестиции, което допринесе за повишаване на заетостта и личните доходи. Развитието на кредитирането благоприятства нарастването на производството и потреблението в страната.

През 2005 г. цените на енергийните източници бяха с най-голям принос за инфлацията, следвани от тези на непреработените храни, а през 2006 г. и 2007 г. преработените храни имаха водещо значение за общото покачване на цените. Най-високият темп на инфлацията в България бе през 2008 г. (12%), като основен принос имаше повишението на международните цени на храните и суровия петрол, от чийто внос страната е силно зависима. Важни източници на инфлация през 2007 г. и 2008 г. бяха и увеличените разходи за труд, ускореното нарастване на вътрешното търсене и на административно определяните цени и такси.

Икономическата рецесия от 2009 г. допринесе за резкия спад на инфлацията (2.5% на годишна база), а инфлационният диференциал спрямо еврозоната съществено намаля. Увеличението на цените на услугите и базисната инфлация допринесоха основно за размера на ХИПЦ, а цените на вноса имаха ограничен принос не само поради слабата промяна в цените на световния пазар, но най-вече поради свиването на вноса. Кризата създава благоприятни предпоставки за доближаване до изпълнението на критерия за ценова стабилност, като основните източници на инфлация се промениха. Цените на вноса ще продължат да играят водеща роля, а местните източници на инфлация имат ограничен принос.

[2] What drives inflation in the NMS? Proceedings of the workshop held on 22.10.2008. Occasional papers N 50, European Commission, 2009.

Таблица 2

**ПРИНОС НА КОМПОНЕНТИТЕ НА ХИПЦ ЗА ИНФЛАЦИЯТА В БЪЛГАРИЯ**

(%)

| | 2005 | 2006 | 2007 | 2008 | 2009 | МАРТ 2010 |
|---|---|---|---|---|---|---|
| **ХИПЦ** | 6.0 | 7.4 | 7.6 | 12.0 | 2.5 | 1.7 |
| **Неенергийни промишлени стоки** | 2.2 | 2.6 | 4.4 | 6.0 | 2.9 | 1.8 |
| **Енергийни стоки** | 12.8 | 5.2 | 5.1 | 12.5 | - 5.7 | - 3.3 |
| **Непреработени храни** | 10.8 | 5.4 | 6.3 | 10.9 | 1.3 | - 1.2 |
| **Преработени храни** | 1.4 | 18.5 | 13.4 | 17.2 | 2.4 | 2.1 |
| **Услуги** | 6.7 | 6.5 | 7.8 | 12.7 | 5.8 | 4.2 |
| **ХИПЦ, с изключение на енергийни стоки и непреработени храни (базисна инфлация)** | 3.6 | 8.1 | 8.2 | 12.0 | 4.1 | 3.0 |

Източници: ЕК и Евростат.

В теорията инфлационната динамика в страната се свързва с т.нар. триъгълник на несъвместимостта[3] между режима на ПС, процеса на догонване и изпълнението на Маастрихтските критерии. Режимът на ПС съдейства за намаляване на темповете на инфлация и за повишаване на ценовата стабилност, но това основно негово достойнство не е съвместимо с процеса на сближаване на ценовите равнища с еврозоната, тъй като конвергенцията в цените е неизменно съпътствана от по-висока инфлация в присъединяващите се страни, и то в дългосрочен период. В същото време се изисква преди приемането в еврозоната държавата да е постигнала „висока степен на ценова стабилност". Тази несъвместимост се проявяваше осезаемо през анализирания период. Реалната конвергенция в цените се ускори и средните ценови равнища на голяма част от стоките в много голяма степен достигнаха тези на ЕС, докато при услугите съществува потенциал за наваксване.

Данните за динамиката на ХИПЦ в държавите от ЦИЕ – кандидатки за еврозоната, сочат, че инфлацията в държавите с фиксирани валутни курсове (Литва, Латвия, Естония и България)

[3] *Nenovsky, N., K. Dimitrova,* Dual Inflation under the Currency board: The challenges of Bulgarian EU accession; The William Davidson Institute, Working paper 487, 2002.

е неколкократно по-висока от тази в държавите с инфлационно таргетиране (Полша, Чехия). В периода 2004–2008 г. нито една от осемте държави от ЦИЕ не изпълняваше критерия за ценова стабилност, тъй като според изискванията на Европейската комисия (ЕК) и Европейската централна банка (ЕЦБ) държавите-кандидатки трябва устойчиво да го покриват, т.е. инфлацията да бъде под референтната стойност и да е основана на трайни икономически предпоставки.

Таблица 3

**ХИПЦ-ИНФЛАЦИЯ В ЦИЕ-8***

(% на годишна база)

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| **Средно за трите страни в ЕС с най-ниска инфлация**** | 0.67 | 1.3 | 1.5 | 1.33 | 2.57 | 0.23 |
| **Референтна стойност за ЕС** | 2.17 | 2.80 | 3.00 | 2.83 | 4.07 | 1.73 |
| **България** | 6.1 | 6.0 | 7.4 | 7.6 | 12.0 | 2.5 |
| **Естония** | 3.0 | 4.1 | 4.4 | 6.7 | 10.6 | 0.2 |
| **Латвия** | 6.2 | 6.9 | 6.6 | 10.1 | 15.3 | 3.3 |
| **Литва** | 1.2 | 2.7 | 3.8 | 5.8 | 11.1 | 4.2 |
| **Полша** | 3.6 | 2.2 | 1.3 | 2.6 | 4.2 | 4.0 |
| **Румъния** | 11.9 | 9.1 | 6.6 | 4.9 | 7.9 | 5.6 |
| **Унгария** | 6.8 | 3.5 | 4.0 | 7.9 | 6.0 | 4.0 |
| **Чехия** | 2.6 | 1.6 | 2.1 | 3.0 | 6.3 | 0.6 |

* ЦИЕ-8 обхваща осемте държави от ЦИЕ – кандидатки за приемане на еврото.

** През 2004 г. страните с най-ниска инфлация бяха Финландия (0.1%), Германия (0.9%), Швеция (1.0%); през 2005 г. Швеция (0.8%), Холандия (1.5%), Чехия (1.6%); през 2006 г. Полша (1.3%), Швеция (1.5%) и Австрия (1.7%); през 2007 г. Малта (0.7%), Холандия (1.6%) и Дания (1.7%); през 2008 г. Холандия (2.2%), Португалия (2.7%) и Германия (2.8%); през 2009 г. Франция (0.1%), Германия (0.2%) и Австрия (0.4%).

Източник: Евростат.

При държавите с фиксирани валутни курсове запазването на инфлацията за по-дълго време на по-високо равнище доведе до реално надценяване на местните валути, което има негативен ефект върху конкурентоспособността на износа и върху състоянието на платежния баланс. За разлика от държавите с инфлационно таргетиране България, Литва, Латвия и Естония натрупаха големи вътрешни и външни дисбаланси. Тези държави нямат възможност да променят номиналното равнище на обменния курс и да влияят върху процеса на ценова конвергенция, а реалните

лихвени равнища се понижиха вследствие на по-високата инфлация. Това породи кредитен бум и прегряване на икономиките преди кризата, което ги направи твърде уязвими на външни шокове. В същото време обаче Българската народна банка затягаше надзорната си политика върху банките, което не позволи появата на банкова и финансова криза впоследствие.

В докладите за конвергенцията на ЕЦБ[4] и ЕК[5] от май 2010 г. за първи път референтната стойност на ХИПЦ е изчислена на основата на „отрицателна инфлация" в три държави – членки на ЕС, за периода април 2009 г. – март 2010 г.: Португалия (-0.8%), Естония (-0.7%) и Белгия (-0.1%). Това тълкуване на критерия от страна на ЕЦБ и ЕК е в очевидно нарушение на принципа на равно третиране на държавите – кандидатки за еврозоната, но по-голямо недоумение в случая буди фактът, че този подход се намира в пълно противоречие и е несъвместим с дефиницията за ценова стабилност, приета от ЕЦБ. На 13 октомври 1998 г. Управителният съвет на ЕЦБ прие Стратегия за парична политика, според която „ценова стабилност означава годишно нарастване на ХИПЦ за еврозоната с не повече от 2%", а основна цел на ЕЦБ е поддържането равнището на инфлация под, но близо до 2% в средносрочен период. Не само инфлация над 2%, но и дефлация са несъвместими с ценовата стабилност, като това е достатъчно ниска стойност за икономиката, за да може тя да се възползва от предимствата на ценовата стабилност[6]. През последния 12-месечен период няколко държави – членки на ЕС, отчитат отрицателни средни темпове на инфлация, което даде формално основание ЕЦБ и ЕК да направят оценка на конвергенцията на основата на дефлация в „инцидентен период на отрицателна инфлация"[7]. Прилагането на този подход доказва, че присъединяването към еврозоната на новите държави-членки зависи все повече от конюнктурни фактори, върху които самите те имат твърде ограничен капацитет да влияят.

[4] Доклад за конвергенцията, май 2010, ЕЦБ.

[5] Convergence report 2010, European Commission.

[6] Доклад за конвергенцията, май 2010, ЕЦБ, с. 9. Виж определението за ценова стабилност на ЕЦБ, www.ecb.europa.eu.

[7] Консолидиран текст на Договора за функционирането на Европейския съюз, ОВ С 83, бр. 47, 30.3.2010.

Таблица 4

**ХИПЦ-ИНФЛАЦИЯ В ЦИЕ-8 И В ЕВРОЗОНАТА**

(%)

| | АПРИЛ 2009 г. – МАРТ 2010 г. |
|---|---|
| **Референтна стойност*** | 1 |
| **Референтна стойност**** | 2.1 |
| **Еврозона** | 0.3 |
| **България** | 1.7 |
| **Естония** | - 0.7 |
| **Латвия** | 0.1 |
| **Литва** | 2.0 |
| **Полша** | 3.9 |
| **Румъния** | 5.0 |
| **Унгария** | 4.8 |
| **Чехия** | 0.3 |

* Референтна стойност за периода април 2009 г. – март 2010 г., използвана от ЕК и ЕЦБ, изчислена на база (де)инфлация: Белгия (-0.1%); Естония (-0.7%) и Португалия (-0.8%) + 1.5%.

** Референтна стойност за периода април 2009 г. – март 2010 г., изчислена въз основа на най-ниската инфлация в три държави от ЕС: Германия (0.2%), Латвия (0.1%) и Словакия (0.3%) + 1.5 = 2.1.

Източници: Доклади за конвергенцията на ЕК и ЕЦБ, май 2010, и собствени изчисления.

Към март 2010 г. данните показват, че Естония, Латвия и Чехия покриват критерия, а България се доближава значително до неговото постигане. По методологията, съответстваща на принципа на трите страни с най-добри резултати в областта на ценовата стабилност, референтната стойност би била 2.1%, като и България, и Литва щяха да изпълнят критерия. Съгласно чл. 140, параграф 1 от ДФЕС[8] при изчисляването на референтната стойност се вземат предвид равнищата в ХИПЦ на всички държави – членки на ЕС. Проблемът е, че в договорната основа на Съюза понятието „държави с най-добри резултати в областта на ценовата стабилност" не е дефинирано, което дава възможност за различни интерпретации от страна на ЕЦБ и ЕК и послужи като аргумент дефлацията да бъде ползвана като „икономически съществен бенчмарк" [9].

[8] Пак там.

[9] Доклад за конвергенцията, май 2010, ЕЦБ, с. 10.

1.2. Държавна бюджетна позиция

Съгласно ДФЕС, Пакта за стабилност и растеж (ПСР)[10] и два регламента на Съвета: за засилване на наблюдението на бюджетите и координацията на икономическите политики[11] и за ускоряване и изясняване прилагането на процедурата при прекомерен бюджетен дефицит[12], основно задължение на всички държави-членки е да избягват прекомерен бюджетен дефицит (определена е референтна стойност от 3% от БВП), както и да не допускат размерът на публичния дълг да надвишава 60% от БВП на страната[13]. Благоразумната фискална политика и фискалната дисциплина представляват основна предпоставка за поддържане на макроикономическата и финансова стабилност на държавите и на ИПС, в който провеждането на икономически и фискални политики остава изключително правомощие на националните институции.

Държавите – кандидатки за еврозоната, трябва да изпълняват посочените изисквания и да постигнат устойчивост на държавната бюджетна позиция, върху която влияят множество фактори – циклични и нециклични. Изпълнението на тези критерии от държавите в ИПС години наред бе подценявано, но в периода на глобална икономическа криза това породи дългова криза и риск за устойчивостта на еврозоната. Нарушенията на корективния лост на ПСР от самото начало на функционирането на ИПС доведоха до разхлабване на фискалната дисциплина и макроикономически дисбаланси в много държави-членки. През 1999 г. стана ясно, че голяма част от бъдещите участнички в паричния съюз няма да изпълнят критериите (напр. висок бюджетен дефицит и публичен дълг имаха много държави – Австрия, Гърция, Белгия, Холандия, Италия и дори Германия, Испания). Тогава обаче политиката надделя и проблемните критерии бяха пренебрегнати.

Изключително трудна ще бъде задачата на държавите от ЦИЕ да убедят ЕЦБ и ЕК, че не само изпълняват критериите за държавна бюджетна позиция, но и че след влизането им в еврозоната ще

[10] Resolution of the European Council on the Stability and Growth Pact, Amsterdam, 17 June 1997 (OJ C 236, 2.8.1997, p. 1).

[11] Регламент (ЕО) № 1466/97 на Съвета от 7 юли 1997 г. за засилване на надзора върху състоянието на бюджета и на надзора и координацията на икономическите политики (ОВ L 209, 2.8.1997, с. 1).

[12] Регламент (ЕО) № 1467/97 на Съвета от 7 юли 1997 г. за определяне и изясняване на прилагането на процедурата при прекомерен дефицит (ОВ L 209, 2.8.1997, с. 6).

[13] Член 126 от ДФЕС.

ги покриват устойчиво. На преден план излиза проблемът за доверието в провежданите от тях фискални политики, което особено в условията на криза е подложено на сериозно изпитание от европейските институции. Националните правителства започнаха да провеждат стриктна фискална политика с оглед недопускане понататъшно задълбочаване на проблема с дефицитите, което не само че би забавило приемането в еврозоната, но би застрашило финансовата стабилност на държавите.

Благоразумната фискална политика и бюджетната дисциплина са задължително условие за поддържане стабилността на валутните режими в държавите с фиксиран обменен курс, тъй като допускането на високи дефицити може да доведе до значително увеличение на инфлацията, до девалвация на националната парична единица и следователно да дестабилизира икономиките. В периода 2007–2009 г. България бе сред малкото държави – кандидатки за еврозоната, които не са били обект на процедурата при прекомерен дефицит и които безпроблемно изпълняваха критериите за държавна бюджетна позиция. Режимът на ПС налага значителни ограничения върху провежданата от правителството фискална политика най-вече посредством забраната за финансиране на бюджетния дефицит от страна на паричната власт. Законът за БНБ[14] забранява прякото кредитиране на бюджетния дефицит (включително печатането на пари за тази цел), както и провеждане на парична политика чрез операции на открития паричен пазар. Инфлационно финансиране на бюджета е невъзможно и това налага правителството непрекъснато да се стреми към: поддържане на балансиран или нискодефицитен бюджет в средносрочен план; разумна разходна политика; поддържане на ниски и устойчиви нива на държавния дълг. Освен това благоприятното развитие на местната и световната икономика стимулираше постигането на добри бюджетни резултати – отчитането на бюджетни излишъци и намаляването на държавния дълг.

България бе сред държавите – членки на ЕС, с най-стабилни публични финанси преди кризата и силна изходна позиция в началото на световната финансова и икономическа криза. През 2006 г. бюджетният излишък достигна 3% от БВП на страната. Въвеждането на плоския данък през 2007 г. допринесе за

[14] Закон за Българската народна банка, приет на 5 юни 1997 г., посл. изм. и доп., Държавен вестник, бр. 44, 2009 г.

ограничаване на сивата икономика и подобряване на събираемостта на приходите в бюджета. През 2008 г. бе отчетен излишък от 1.8% и страната бе единствената в ЕС, в която той нарастваше на база предходна година.

През 2006 г. и 2007 г. Естония също натрупа излишъци и има най-нисък размер на държавния дълг през последните няколко години в ЕС, следвана по този показател от България. Натрупването на значителни финансови резерви осигури възможности за използването им като средство за смекчаване на въздействието на глобалната криза върху икономиките. По данни на Министерството на финансите фискалният резерв на България в края на 2009 г. е бил в размер на 7672.9 млн. лв. (12% от БВП), а към 30 юни 2010 г. е намалял до 6029.0 млн. лв. и продължава да спада. Покриването на част от дефицита със средства от резерва обаче може да създаде риск за стабилността, а неговото използване би трябвало да бъде основано на цялостна стратегическа визия за развитието на икономиката на страната. В противен случай ще доведе до практическата невъзможност в средносрочен план бюджетът да бъде балансиран.

Таблица 5

**БЮДЖЕТЕН ДЕФИЦИТ( - )/ИЗЛИШЪК(+) И ДЪРЖАВЕН ДЪЛГ В ЕС, ЕВРОЗОНАТА И ЦИЕ-8**

(%)

| | БЮДЖЕТЕН ДЕФИЦИТ/ИЗЛИШЪК | | | | ДЪРЖАВЕН ДЪЛГ | | | |
|---|---|---|---|---|---|---|---|---|
| | 2006 | 2007 | 2008 | 2009 | 2006 | 2007 | 2008 | 2009 |
| **Референтна стойност** | - 3.0 | - 3.0 | - 3.0 | - 3.0 | 60 | 60 | 60 | 60 |
| **ЕС-27** | - 1.4 | - 0.8 | - 2.3 | - 6.8 | 61.3 | 58.7 | 61.5 | 73.6 |
| **Еврозона (16)** | - 1.3 | - 0.6 | - 2.0 | - 6.3 | 68.3 | 66.0 | 69.3 | 78.7 |
| **България** | 3.0 | 0.1 | 1.8 | - 3.9 | 22.7 | 18.2 | 14.1 | 14.8 |
| **Естония** | 2.3 | 2.6 | - 2.7 | - 1.7 | 4.5 | 3.8 | 4.6 | 7.2 |
| **Латвия** | - 0.5 | - 0.3 | - 4.1 | - 9.0 | 10.7 | 9.0 | 19.5 | 36.1 |
| **Литва** | - 0.4 | - 1.0 | - 3.2 | - 8.9 | 18.0 | 16.9 | 15.6 | 29.3 |
| **Полша** | - 3.6 | - 1.9 | - 3.6 | - 7.1 | 47.7 | 45.0 | 47.2 | 51.0 |
| **Румъния** | - 2.2 | - 2.5 | - 5.5 | - 8.3 | 12.4 | 12.6 | 13.6 | 23.7 |
| **Унгария** | - 9.3 | - 5.0 | - 3.8 | - 4.0 | 65.6 | 65.9 | 72.9 | 78.3 |
| **Чехия** | - 2.6 | - 0.7 | - 2.1 | - 5.9 | 29.4 | 29.0 | 30.0 | 35.4 |

Източник: Евростат.

При държавите с инфлационно таргетиране състоянието на държавните бюджетни позиции през последните няколко години преди кризата бе по-различно. Румъния и Чехия изпълняваха критериите за бюджетен дефицит и държавен дълг през 2006 и 2007 г., а Унгария имаше най-големи проблеми с държавната бюджетна позиция. Кризата влоши силно бюджетните позиции на Полша, Чехия и Румъния, като през 2009 г. нито една от тях не покриваше критерия за бюджетен дефицит, а публичният дълг нарасна, но дългова криза в държавите от ЦИЕ няма.

Бързото нарастване на дефицитите в почти всички държави от ЦИЕ в условията на криза (с изключение на Естония) доведе до откриването на процедури при прекомерен дефицит през 2009 г. Естония е единствената държава–кандидатка за еврозоната, която изпълнява критерия за бюджетен дефицит през целия период.

Интерес представлява състоянието на държавните бюджетни позиции на най-новите държави-членки от еврозоната (Словения, Словакия, Малта и Кипър), което първоначално беше по-добро от това на старите държави-членки. След присъединяването към еврозоната бързо нарасна както бюджетният дефицит, така и държавният дълг, което потвърждава тезата, че членството, вместо да бъде стимул за финансова дисциплина, може да доведе до разхлабване на фискалната политика и неблагоразумни действия.

В периода след присъединяването си към ЕС до началото на кризата България бе сред държавите-членки с най-стабилни публични финанси. Тя натрупа значителни финансови резерви, публичният ѝ дълг бе сред най-ниските в Съюза. България навлезе в кризата с много добра държавна бюджетна позиция, но отчетеният през 2009 г. свръхдефицит доведе до откриването на първата процедура при прекомерен дефицит. Въпреки това финансовите резерви вече допринесоха за смекчаване на въздействието на глобалната криза върху икономиката, но по-нататъшното им използване може да създаде рискове пред стабилността, освен ако не съответства на ясна визия за развитие на икономиката.

1.3. Дългосрочни лихвени проценти

Според договорната основа на ЕС „трайността на конвергенцията, постигната от държавата-членка с дерогация и от нейното участие във валутния механизъм, намира отражение в размера на лихвените проценти в дългосрочен аспект“[15]. Това означава, че за период от една година преди осъществяването на оценката държавата-членка трябва да е имала среден размер на номиналния лихвен процент по дългосрочните кредити, който не превишава с повече от 2 пр.п. тези на три държави-членки, имащи най-добри резултати в областта на ценовата стабилност.

През 2006–2008 г. България изпълняваше този критерий, като стойностите на показателя бяха значително под референтната му стойност за ЕС. Важна роля за това има паричният режим в страната, чието функциониране влияе положително върху конвергенцията на лихвените проценти с тези в еврозоната. Влиянието на ПС върху ценовата стабилност и конвергенцията на лихвените проценти доказва, че избраният паричен режим в най-висока степен възпроизвежда условията, при които функционира една икономика в рамките на еврозоната. Лихвеният диференциал между България и еврозоната се формира основно от: рисковата премия на страната и региона, валутния риск (въпреки фиксирането на валутата валутният риск не е премахнат напълно) и инфлационните очаквания.

След присъединяването към ЕС спредът между дългосрочните лихвени проценти в България и еврозоната се разширяваше постепенно през 2007 г. и 2008 г. вследствие на растящия инфлационен диференциал и прегряването на икономиката. Същата тенденция се прояви и в останалите държави от региона. При държавите с инфлационно таргетиране основна причина бяха колебанията във валутните курсове.

[15] Чл. 140, параграф 1 от Договора за функционирането на Европейския съюз.

Таблица 6

**ДЪЛГОСРОЧНИ ЛИХВЕНИ ПРОЦЕНТИ В ЦИЕ-8**

(%)

| | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| **Референтна стойност за ЕС*** | 6.25 | 6.19 | 6.24 | 5.53 |
| **България** | 4.18 | 4.54 | 5.38 | 7.22 |
| **Естония**** | ..... | ..... | ..... | ..... |
| **Латвия** | 4.13 | 5.28 | 6.43 | 12.36 |
| **Литва** | 4.10 | 4.55 | 5.61 | 14.00 |
| **Полша** | 5.23 | 5.48 | 6.07 | 6.12 |
| **Румъния** | 7.23 | 7.13 | 7.70 | 9.69 |
| **Унгария** | 7.12 | 6.74 | 8.24 | 9.12 |
| **Чехия** | 3.77 | 4.68 | 4.30 | 7.22 |

* Референтната стойност, изчислена на основата на средногодишното изменение на ХИПЦ в трите държави с най-ниска инфлация, е за целите на анализа, като нейните стойности за периода 2006–2009 г. не съвпадат с тези на ЕЦБ и ЕК, публикувани в докладите за конвергенцията през 2006 г., 2007 г. и 2008 г., които бяха съответно: 2.6%, 3.0% и 3.2%. За оценката на изпълнение на критерия за ценова стабилност ЕЦБ и ЕК изчисляват референтни стойности само към момента на подготовка на докладите като средна величина за последните 12 месеца (напр. за април 2009 г. – март 2010 г.).

** Естония няма дългосрочни лихвени проценти. ЕЦБ изчислява индикатор за равнището на лихвените проценти на паричните и финансовите институции, който представлява претеглена стойност на лихвените равнища на новите заеми в естонски крони на домакинствата и нефинансовите предприятия при определени краткосрочни, средносрочни и дългосрочни лихвени проценти. Естония има твърде ограничен държавен дълг и не разполага с подходящи дългосрочни държавни облигации, които да бъдат използвани за определяне на дългосрочните лихвени проценти.

Източници: ЕЦБ, собствени изчисления.

Оценката, направена в докладите за конвергенцията от 2010 г., показва, че единствено Чехия изпълнява критерия за дългосрочните лихвени проценти, а Полша и България се доближават до референтната стойност. Промяната в методологията на изчисляване на референтната стойност на критерия за ценова стабилност от страна на ЕЦБ и ЕК обаче рефлектира и върху изчисляването на референтната стойност на дългосрочните лихвени проценти. В обратния случай България, Полша, Чехия и Унгария щяха да покриват критерия.

Таблица 7

**ДЪЛГОСРОЧНИ ЛИХВЕНИ ПРОЦЕНТИ В ЦИЕ-8 (БЕЗ ЕСТОНИЯ)**

(%)

| | АПРИЛ 2009 г. – МАРТ 2010 г. |
|---|---|
| **Референтна стойност в докладите*** | 6.0 |
| **Референтна стойност**** | 8.8 |
| **България** | 6.9 |
| **Латвия** | 12.7 |
| **Литва** | 12.1 |
| **Полша** | 6.1 |
| **Румъния** | 9.4 |
| **Унгария** | 8.4 |
| **Чехия** | 4.7 |

* В докладите за конвергенцията е посочено, че референтната стойност е изчислена на основата на дългосрочните лихвени равнища в Белгия и Португалия през март 2010 г., които са били съответно 3.8% и 4.2% плюс 2 пр.п. Естония не е включена, тъй като няма хармонизиран бенчмарк на дългосрочни държавни облигации или сравними ценни книжа, които да бъдат използвани при калкулирането на референтната стойност.

** Референтна стойност, изчислена на основата на дългосрочните лихвени проценти за период от 1 година преди оценката в трите страни с най-ниска инфлация: за Германия – 3.25%; Латвия – 12.73%, и Словакия – 4.54%.

Източници: Доклади за конвергенцията на ЕК и ЕЦБ, май 2010, и собствени изчисления.

Разпространението на икономическата криза в региона доведе до рязко нарастване на дългосрочните лихвени проценти във всички държави поради рецесията, колебанията на обменните курсове, както и поради банковата криза в някои от тях, което покачи рисковата премия по ДЦК и на региона през 2009 г. Дълговата криза в Гърция се отрази негативно върху рисковата премия на региона и това доведе до невъзможност страната да покрие този критерий. Независимо от това от началото на 2010 г. започна тенденция към спад на показателя за България благодарение на относително добрата държавна бюджетна позиция. Актуалните данни на БНБ за равнището на дългосрочния лихвен процент показват, че в периода април–юни 2010 г. той е бил 6.09%, а през юли спада до 6.04%. Важно е да се отбележи обаче, че сближаването на дългосрочните лихвени проценти продължава и след приемането на еврото поради пълното отпадане на валутния риск за държавите.

Много важно въздействие върху дългосрочните лихвени равнища оказва кредитният рейтинг на държавите. В края на юли 2010 г. *Standard & Poor's* публикува доклад за кредитния

рейтинг на България, според който той продължава да бъде стабилен *(BBB/Stable/A-3)*[16] поради поддържането на подходяща фискална политика и нисък брутен дълг въпреки тежката рецесия, солидните перспективи за растеж на страната в средносрочен план, както и нейното членство в ЕС. В края на август 2010 г. рейтинговата агенция *Moody's* публикува информация за България[17], като перспективата за развитие на страната е определена като положителна, а рейтингът по държавните облигации е *Baa3*.

1.4. Стабилност на обменния курс

Съгласно ДФЕС и Протокол 13 относно критериите за конвергенция стабилността на обменния курс се свързва със „спазване нормални граници на отклонение, в съответствие с предвиденото от валутния механизъм на Европейската парична система, в продължение на най-малко две години, без да е осъществено девалвиране спрямо еврото. В частност държавата-членка не трябва да е осъществявала през същия период девалвация на централния курс на своята валута спрямо еврото по своя собствена инициатива". Определен е диапазон на колебание на валутния курс от ±15%. Във ВМ II се влиза доброволно.

Понастоящем валутите на Естония, Латвия и Литва участват във ВМ II. Режимите на фиксирани валутни курсове в тези държави запазват стабилността си и в настоящата криза, независимо от последиците от нея.

[16] Виж доклада български език на: www.minfin.bg/document/8165.
[17] Виж www.minfin.bg/bg/pubs/1/3992.

Таблица 8

**ПАРИЧНИ РЕЖИМИ В ЦИЕ-8 И ДОСТИГНАТ ЕТАП В ПРОЦЕСА НА ПОДГОТОВКА ЗА ЧЛЕНСТВО В ЕВРОЗОНАТА**

| ДЪРЖАВА | ПАРИЧЕН РЕЖИМ | УЧАСТИЕ ВЪВ ВМ II |
|---|---|---|
| **България** | Паричен съвет, фиксиран курс на лева към еврото от 1997 г. | Не |
| **Естония** | Паричен съвет, фиксиран курс на естонската крона към еврото | От 28.06.2004 г. На 1 януари 2011 г. ще приеме еврото |
| **Латвия** | Фиксиран курс към СПТ до 2004 г., а след това към еврото | От 02.05.2005 г. (отклонение от ±1% от договорения курс) |
| **Литва** | Паричен съвет от 1994 г. с фиксиран курс към долара, а от 2002 г. с фиксиран курс на към еврото | От 28.06.2004 г. |
| **Полша** | Инфлационно таргетиране и свободно плаващ курс от 2000 г. | Не |
| **Румъния** | Инфлационно таргетиране, контролирано плаващ курс от 2005 г. | Не |
| **Унгария** | Инфлационно таргетиране, свободно плаващ курс от 2008 г. | Не |
| **Чехия** | Инфлационно таргетиране; управлявано плаващ курс от 1998 г. | Не |

Източник: Европейска комисия.

Българският лев не участва във ВМ II, въпреки че България стана член на ЕС на 1 януари 2007 г. Водеща роля за допускане на дадена държава във ВМ II има ЕЦБ, както и политическият консенсус в държавите от еврозоната. В настоящата ситуация силно негативно влияние върху присъединяването на България към ВМ II имат проблемите със свръхдефицита, въпреки че в договорната основа на ЕС критерии за приемане в механизма няма. Може да се предположи, че допускането във ВМ II ще стане едва когато бюджетният дефицит бъде намален под 3% от БВП, а освен това правителството трябва да докаже, че консолидацията на бюджета ще продължи и той ще бъде балансиран. В тази връзка влизането във ВМ II би могло да се осъществи не по-рано от 2012 г., а присъединяването към еврозоната най-рано през 2014 г. или 2015 г.

Съгласно основните стратегически документи, приети от правителството и БНБ във връзка с присъединяването на България към ИПС – Споразумение между Министерския съвет на Република България и БНБ за въвеждане на еврото в Република България[18] и Стратегия за развитие на БНБ 2004–2009 г.[19], българските институции се ангажираха с възможно най-бързо присъединяване към ВМ II и еврозоната, но това е дълъг, сложен и сериозен политически процес. Ключов елемент на Стратегията на България представлява ангажиментът за поддържане на ПС и запазване на съществуващото равнище на фиксиран валутен курс на българския лев към еврото до датата на приемане на еврото. Режимът на паричен съвет в процеса на присъединяване към еврозоната не представлява проблем за страната, а изследвания по проблема на Н. Неновски[20] и Г. Минасян[21] потвърждават, че ПС е значително по-добър вариант от връщането към традиционна централна банка, и нещо повече – на фона на невъзможността за едностранна евроизация ПС е единственият възможен избор на валутен режим за България[22].

В доклада ИПС@10 на ЕК се посочва, че „репутацията на новите държави-членки с режими на *фиксиран валутен курс* дава известна увереност в техните възможности да се справят с ограниченията вследствие фиксирания валутен режим"[23]. През ноември 2000 г. Съветът Екофин прие за първи път Доклад относно аспектите на валутния режим в процеса на разширяване[24], а през 2003 г. ЕЦБ излезе със свое становище. Двата документа потвърждават, че между държавите съществуват големи различия, и посочват, че няма общ път към ВМ II и приемането на еврото, който всички кандидатки да следват. Признава се, че режимите на фиксиран

[18] Споразумение между Министерския съвет на Република България и Българската народна банка за въвеждане на еврото в Република България, ноември 2004 г.

[19] Стратегия за развитие на Българската народна банка 2004–2009 г., приета на 9 септември 2004 г.

[20] *Неновски, Н., К. Христов, Б. Петров.* От лев към евро – кой е най-добрият път. С.: Сиела, 2001.

[21] *Минасян, Г.* Пътят към евро: Опитът на страните от Източна Европа с паричен съвет. С.: Марин Дринов, 2004.

[22] *Христов, К.* Паричният съвет: The only game in town. С.: БНБ, 2004. Дискусионни материали № 40.

[23] ИПС@10 Успехи и предизвикателства след десетте години Икономически и паричен съюз, ЕК, 2008 г.

[24] Report by the (ECOFIN) Council to the European Council in Nice on the exchange rate aspects of enlargement, Brussels, 8.11.2000, Council of the European Union.

валутен курс към еврото като цяло са съвместими с особеностите на ВМ II и могат да бъдат запазени, докато държавите влязат в еврозоната, но те не се считат за заместител на участието в механизма.[25] Пред българските институции стои нелеката задача да докажат, че съществуващият фиксиран курс на лева към еврото е оптимален, основан е на макроикономически фундаменти в страната и трябва да бъде запазен при приемането на общата валута.

## *2. Реална конвергенция*

2.1. Ценови равнища

Степента на готовност на държавите за пълноправно членство в ИПС предполага проследяване на тенденциите в ценовите равнища и доходите, които в процеса на икономическа и парична интеграция се доближават и изравняват с тези в еврозоната. Това не са договорни критерии за приемане на държавата-кандидатка в еврозоната, но те отразяват напредъка в номиналната конвергенция. Реалното сближаване протича с различна скорост в държавите-кандидатки и под влиянието както на общи, така и на специфични фактори.

Данните на Евростат от 2008 г. показват, че ценовите равнища в България се намират на 51% от средните за ЕС (48% от средното за еврозоната), като цените на електрониката, дрехите, обувките, домакинските уреди се доближават в най-голяма степен до средните в Съюза. След вдигането на акцизите на цигарите (от 1 януари 2010 г.) сближаването в цените на тези стоки също нарасна. При цените на храните конвергенцията също е висока, но въпреки това ценовите равнища в България са най-ниски. В държавите с по-ниски доходи стоките са и относително по-евтини, а в дългосрочен план изравняването на цените ще продължи, което предполага наличието и на по-висока инфлация. Допълнителен стимул за сближаване ще бъде приемането на еврото, тъй като използването на общата валута създава благоприятни предпоставки за интензифициране на търговията между страните, ускоряване на финансовата интеграция, отпадане на валутния риск и конвергенция на лихвените проценти.

[25] ECB, Policy position of the Governing Council of the ECB on exchange rate issues relating to the acceding countries, 18 December 2003.

Таблица 9

**ИНДЕКС НА ЦЕНОВИТЕ РАВНИЩА В БЪЛГАРИЯ ПРЕЗ 2008 г. (ЕС-27 = 100)**

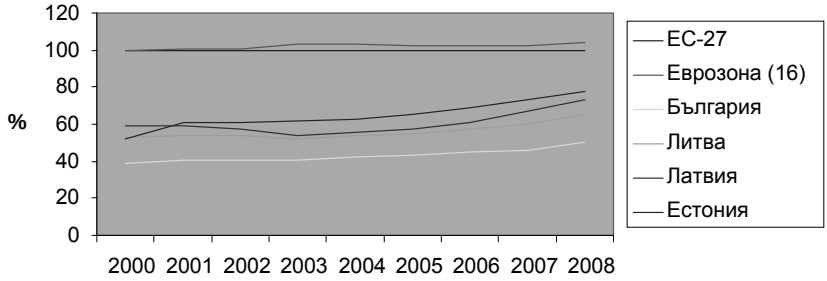
| | |
|---|---|
| Храни и безалкохолни напитки | 67 |
| Алкохол и цигари | 63 |
| Дрехи | 84 |
| Обувки | 80 |
| Електричество, газ и други горива | 59 |
| Обзавеждане | 61 |
| Домакински уреди | 84 |
| Електроника | 96 |
| Транспортни услуги | 44 |
| Комуникации | 75 |
| Ресторанти и хотели | 40 |

Източник: Евростат.

От държавите с фиксирани курсове към еврото Естония е постигнала най-висока степен на сближаване на средните ценови равнища с ЕС – 78%, а от държавите-кадидатки с инфлационно таргетиране това е Чехия (73%). Скоростта на конвергенция в отделните държави от ЦИЕ е различна, като средното ценово равнище се е повишило най-съществено в Словакия (от 44% до 71%), а най-слабо в Словения (от 73% до 82%).

Графика 1

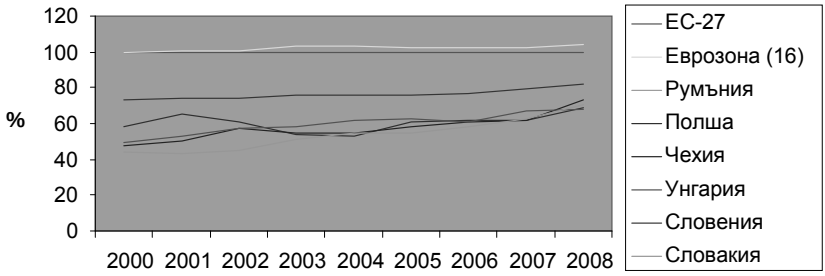
**ИНДЕКС НА СРАВНИТЕЛНИТЕ ЦЕНОВИ РАВНИЩА В ЕС, ЕВРОЗОНАТА И ДЪРЖАВИТЕ ОТ ЦИЕ С ФИКСИРАНИ ОБМЕННИ КУРСОВЕ**




Източник: Евростат.

Графика 2

**ИНДЕКС НА СРАВНИТЕЛНИТЕ ЦЕНОВИ РАВНИЩА В ЕС, ЕВРОЗОНАТА И ДЪРЖАВИТЕ ОТ ЦИЕ С ИНФЛАЦИОННО ТАРГЕТИРАНЕ**




Източник: Евростат.

България има най-ниски ценови равнища в ЕС въпреки големия напредък, осъществен в процеса на реално сближаване през последните години. Реалната конвергенция е продължителен процес, върху който оказват влияние множество фактори, а допълнителен стимул за сближаване ще бъде и приемането на еврото.

2.2. Доходи

Важен индикатор за стандарта на живот в държавите – членки на ЕС, и за благосъстоянието представлява БВП на човек от населението по стандарт на покупателната способност (БВП по СПС). С изключение на Естония държавите с фиксирани курсове започнаха прехода със значително по-ниски стойности на БВП по СПС в сравнение с държавите с инфлационно таргетиране (без Румъния), а през 2009 г. равнищата му като цяло се изравниха. Най-ниски бяха доходите в България и Румъния, съответно 26.9% и 26.0%, а най-високи – в Чехия (68.5%). Всички държави с фиксирани курсове постигнаха голям напредък в процеса на сближаване на доходите, които в реално изражение нараснаха средно 3 пъти за периода, докато при държавите с инфлационно таргетиране (без Румъния) БВП на човек от населението в евро нарасна средно 2 пъти. През 2008 г. България остана на последна позиция с 4500 евро на човек от населението – стойност, съответстваща на изходната позиция на Естония през 2000 г. и 4 пъти по-ниска от тази на Словения през 2008 г. Икономическата криза повлия негативно

върху равнището на БВП по СПС, като в най-тежко засегнатите държави – Естония, Латвия, Литва, Унгария, доходите през 2009 г. спаднаха. В България и Чехия те се запазиха на равнищата от 2008 г., а единствено в Полша нараснаха.

Таблица 10

**БВП НА ЧОВЕК ОТ НАСЕЛЕНИЕТО В ЕС, В ЕВРОЗОНАТА И В ЦИЕ-8**

(%)

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| **ЕС** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Еврозона** | 115.0 | 113.5 | 112.6 | 111.8 | 110.6 | 110.6 | 110.2 | 109.2 | 108.5 | 113.3 |
| **България** | 27.8 | 29.3 | 31.0 | 32.5 | 33.7 | 34.5 | 36.5 | 37.7 | 41.3 | 41.0 |
| **Естония** | 45.0 | 46.4 | 50.0 | 54.5 | 57.4 | 61.6 | 65.1 | 68.8 | 67.4 | 62.0 |
| **Латвия** | 36.7 | 38.7 | 41.2 | 43.3 | 45.7 | 48.6 | 51.6 | 55.7 | 57.3 | 49.0 |
| **Литва** | 39.3 | 41.5 | 44.1 | 49.1 | 50.5 | 52.9 | 55.3 | 59.3 | 61.9 | 53.0 |
| **Полша** | 48.2 | 47.6 | 48.3 | 48.9 | 50.6 | 51.3 | 51.9 | 54.4 | 56.4 | 61.0 |
| **Румъния** | 26.1 | 27.8 | 29.4 | 31.3 | 34.1 | 35.0 | 38.4 | 41.6 | .... | 45.0 |
| **Унгария** | 56.0 | 58.7 | 61.3 | 63.2 | 63.1 | 63.2 | 63.2 | 62.6 | 64.4 | 63.0 |
| **Чехия** | 68.5 | 70.2 | 70.4 | 73.4 | 75.1 | 75.9 | 77.6 | 80.1 | 80.3 | 80.0 |

Източник: Евростат.

В доклада „Пет години от разширяването на ЕС – икономически постижения и предизвикателства"[26] данните показват, че страни с първоначално по-нисък БВП на човек от населението наваксват сравнително по-бързо своето изоставане от останалите поради ускореното нарастване на производството след 2004 г., като скоростта на сближаване зависи от действителния размер на разликата в дохода.

При сравнение на данните за БВП на човек от населението по СПС става ясно, че реалната конвергенция на държавите от ЦИЕ извън еврозоната се осъществява по-бързо в сравнение с някои държави-членки от еврозоната, като Гърция, Испания, Португалия. Възниква въпросът, дали бързото присъединяване на държави с ниско равнище на доходите не крие рискове от забавяне на процеса на реална конвергенция. Всички държави в еврозоната бяха постигнали висока степен на реална конвергенция в доходите преди приемането на единната валута, но и техните изходни позиции бяха значително по-добри от тези на голяма част от държавите от ЦИЕ.

[26] Five years of an enlarged EU – Economic achievements and challenges, European Commission, European economy 1/2009.

Таблица 11

**РАВНИЩЕ НА КОНВЕРГЕНЦИЯ НА НЯКОИ ДЪРЖАВИ ПРИ ВЛИЗАНЕТО ИМ В ЕВРОЗОНАТА (ЕС-27 = 100; БВП СПРЯМО СРЕДНИЯ БВП ЗА ЕС)**

(%)

| ДЪРЖАВИ | ПРИ ВЛИЗАНЕ В ЕВРОЗОНАТА | 2009 г. |
|---|---|---|
| **Гърция** | 68.3 | 95 |
| **Ирландия** | 126.0 | 131 |
| **Испания** | 96.3 | 103 |
| **Кипър** | 90.8 | 98 |
| **Малта** | 76.4 | 78 |
| **Португалия** | 71.5 | 78 |
| **Словакия** | 72.2 | 72 |
| **Словения** | 87.6 | 86 |

Източник: Евростат.

Реалната конвергенция бе резултат от високия икономически растеж на държавите от региона през последното десетилетие, стимулиран от реформите в тях, както и от процеса на присъединяване към ЕС. Водеща роля има моделът на икономическо развитие в държавите преди началото на кризата. Държавите с инфлационно таргетиране осъществиха по-добро преструктуриране на икономиката в началото на прехода и се ориентираха към развитие на търгуемите сектори, като поддържаха относително малки вътрешни и външни дисбаланси. В България значителна част от ПЧИ бяха в преработващата промишленост, но страната се отличаваше с неустойчиво развитие на външния сектор и висока инфлация.

Таблица 12

**ГОДИШЕН ТЕМП НА РАСТЕЖ НА БВП В ЕС-27, ЕС-15*, ЕВРОЗОНАТА И ЦИЕ-8**

(%)

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | СРЕДНО за 2000 – 2009 г. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ЕС-27** | 3.9 | 2.0 | 1.2 | 1.3 | 2.5 | 2.0 | 3.2 | 2.9 | 0.8 | - 4.1 | 1.57 |
| **ЕС-15** | 3.9 | 1.9 | 1.2 | 1.2 | 2.3 | 1.8 | 2.9 | 2.6 | 0.6 | - 4.1 | 1.43 |
| **Еврозона** | 3.9 | 1.9 | 0.9 | 0.8 | 2.1 | 1.7 | 2.9 | 2.7 | 0.7 | - 4.0 | 1.36 |
| **България** | 5.4 | 4.1 | 4.5 | 5.0 | 6.6 | 6.2 | 6.3 | 6.2 | 6.0 | - 5.9 | 4.44 |
| **Естония** | 9.6 | 7.7 | 7.8 | 7.1 | 7.5 | 9.2 | 10.4 | 6.3 | - 3.6 | - 13.7 | 4.83 |
| **Латвия** | 6.9 | 8.0 | 6.5 | 7.2 | 8.7 | 10.6 | 12.2 | 10.0 | - 4.6 | - 18.0 | 4.75 |
| **Литва** | 4.2 | 6.7 | 6.9 | 10.2 | 7.4 | 7.8 | 7.8 | 8.9 | 3.0 | - 18.1 | 4.48 |
| **Полша** | 4.3 | 1.2 | 1.4 | 3.9 | 5.3 | 3.6 | 6.2 | 6.6 | 5.0 | 1.2 | 3.87 |
| **Румъния** | 2.1 | 5.7 | 5.1 | 5.2 | 8.5 | 4.2 | 7.9 | 6.2 | 7.1 | - 8.0 | 4.44 |
| **Унгария** | 5.2 | 4.1 | 4.4 | 4.3 | 4.7 | 3.9 | 4.0 | 1.2 | 0.6 | - 6.5 | 2.59 |
| **Чехия** | 3.6 | 2.5 | 1.9 | 3.6 | 4.5 | 6.3 | 6.8 | 6.1 | 3.0 | - 4.8 | 3.35 |

* ЕС-15 обхваща старите държави – членки на ЕС, т.е. влизащите в състава на ЕС до 2004 г.

*Източници:* Евростат, собствени изчисления.

Доказано е, че в периода на европейска интеграция темповете на растеж в новите държави-членки са били значително по-високи, отколкото наблюдаваните при началното интегриране на старите държави-членки.[27]

Основна причина за растежа бе притокът на чужди капитали, особено в държавите с фиксирани курсове, поради очакванията за бърза конвергенция, доверието във функциониращия режим, строгата фискална политика, а също и ниското заплащане на труда. Притокът на капитали в България бе един от най-високите сред нововъзникващите пазарни икономики, като през 2007 г. инвестициите бяха почти 30% от БВП. В същото време кредитите за частния сектор нараснаха двойно, което доведе до бум в растежа и натрупването както на външни, така и на вътрешни дисбаланси.[28]

[27] *Bower, U., A. Turrini,* EU accession: A road to fast track convergence?, Economic papers 393, European Commission, December 2009.

[28] Bulgaria 2010, IMF country report, June 2010.

Таблица 13

**ПРИТОК НА ПРЕКИ ЧУЖДЕСТРАННИ ИНВЕСТИЦИИ В ЦИЕ-10***

(дял от БВП; %)

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|
| **ЕС-27** | ... | ... | 0.5 | 1.2 | 2.0 | 3.3 | 1.6 | 1.9 |
| **България** | 3.9 | 10.5 | 13.8 | 14.4 | 24.7 | 29.7 | 19.2 | 9.5 |
| **Естония** | 3.9 | 9.4 | 8.0 | 20.6 | 10.8 | 12.8 | 8.2 | 8.8 |
| **Латвия** | 2.7 | 2.7 | 4.6 | 4.4 | 8.3 | 8.1 | 3.7 | 0.3 |
| **Литва** | 5.1 | 1.0 | 3.4 | 4.0 | 6.0 | 5.2 | 3.9 | 0.9 |
| **Полша** | 2.1 | 2.2 | 5.1 | 3.4 | 5.7 | 5.5 | 2.7 | 2.7 |
| **Румъния** | 2.5 | 3.7 | 8.5 | 6.5 | 9.2 | 5.8 | 6.9 | 3.9 |
| **Словакия** | 15.6 | 6.5 | 7.2 | 5.1 | 8.4 | 4.8 | 3.6 | -0.1 |
| **Словения** | 3.2 | 3.6 | 2.1 | 2.3 | 1.6 | 3.8 | 3.5 | -0.1 |
| **Унгария** | 4.5 | 2.5 | 4.4 | 7.0 | 6.5 | 4.2 | 3.0 | 1.1 |
| **Чехия** | 11.3 | 2.3 | 4.5 | 9.4 | 3.8 | 6.0 | 5.0 | 1.4 |

* ЦИЕ-10 обхваща държавите от Централна и Източна Европа, присъединили се към ЕС след началото на 2004 г.

Източник: Евростат.

До началото на кризата моделът на икономическо развитие на държавите от ЦИЕ имаше много общи характеристики – навлизането на чуждестранни банки и развитието на финансовата система, притока на ПЧИ, развитието на търговията с ЕС. В периода след 2004 г. инвестициите в производството нараснаха пет пъти, а търсенето на стоки и услуги се увеличи двойно, докато в старите държави-членки ръстът в търсенето остана на равнище от 2% за целия период, а инвестициите в производството нараснаха с около 1% средно след 2004 г.

Таблица 14

**ПРИРАСТ НА КОМПОНЕНТИТЕ НА БВП ПО РАЗХОДИ ЗА КРАЙНО ПОТРЕБЛЕНИЕ В СТАРИТЕ И НОВИТЕ ДЪРЖАВИ – ЧЛЕНКИ НА ЕС**

(%)

| СРЕДНОГОДИШНО ИЗМЕНЕНИЕ ПО ПОСТОЯННИ ЦЕНИ | НОВИ ДЪРЖАВИ–ЧЛЕНКИ | | СТАРИ ДЪРЖАВИ–ЧЛЕНКИ | |
|---|---|---|---|---|
| | III.1999 г. | IV.2008 г. | III.1999 г. | IV.2008 г. |
| **БВП** | 3.4 | 5.6 | 2.2 | 2.2 |
| **Индивидуално потребление** | 4.0 | 5.5 | 2.5 | 1.7 |
| **Потребление на сектор „държавно управление“** | 3.1 | 2.3 | 2.2 | 1.8 |
| **Брутно образуване на основен капитал** | 2.0 | 10.2 | 2.3 | 3.4 |
| **Износ** | 8.7 | 11.8 | 4.8 | 5.7 |
| **Внос** | 7.9 | 12.4 | 5.0 | 5.6 |
| **Принос за БВП: Местно търсене** | 3.4 | 6.4 | 2.2 | 2.1 |
| **Нетен износ** | 0.0 | - 0.8 | 0.0 | 0.1 |

Източници: Евростат, собствени изчисления.

В България прирастът на местното търсене бе следствие от притока на ПЧИ, намаляващата безработица и ускорения растеж на доходите и кредитирането. Основен проблем обаче остана ниската производителност на труда в страната, като преди кризата заплащането изпреварваше по темп на растеж производителността. Преработващата промишленост и секторът на финансовите услуги представляват изключение от тази тенденция, но в същото време България е една от страните в ЕС с най-ниско абсолютно равнище на разходите за труд на единица продукция.

Процесът на реално сближаване зависи и от производителността на труда в държавите, като по-ниската производителност в новите държави-членки обуславя и по-ниски доходи и ценови равнища. През периода производителността на труда нарасна с по-високи темпове в държавите с фиксирани курсове, отколкото в държавите с инфлационно таргетиране, но в началото на процеса на интегрирането им производителността в тях бе и значително по-ниска.

Таблица 15

**ТЕМПОВЕ НА ПРОИЗВОДИТЕЛНОСТ НА ТРУДА НА ЕДИН ЗАЕТ В ЕВРОЗОНАТА И В ЦИЕ-10 (ЕС-27 = 100)**

(%)

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **Еврозона (16)** | 112.8 | 112.0 | 111.1 | 110.5 | 109.5 | 109.8 | 109.6 | 109.6 | 109.3 |
| **България** | 30.4 | 31.4 | 33.0 | 33.4 | 33.7 | 33.6 | 34.6 | 35.1 | 37.2 |
| **Естония** | 46.9 | 48.1 | 51.0 | 54.6 | 57.4 | 60.5 | 61.4 | 65.1 | 63.8 |
| **Латвия** | 40.1 | 41.3 | 43.0 | 44.2 | 45.9 | 48.0 | 49.1 | 51.5 | 52.6 |
| **Литва** | 42.7 | 46.9 | 48.0 | 52.0 | 53.3 | 54.5 | 56.3 | 59.2 | 62.0 |
| **Полша** | 55.2 | 56.0 | 58.7 | 60.0 | 61.5 | 61.4 | 60.8 | 61.8 | 62.0 |
| **Румъния** | 23.6 | 25.6 | 29.3 | 31.1 | 34.5 | 36.0 | 39.6 | 43.3 | 50.2 |
| **Словакия** | 58.0 | 60.5 | 62.5 | 63.3 | 65.4 | 68.6 | 71.5 | 75.8 | 79.2 |
| **Словения** | 76.2 | 76.3 | 77.8 | 79.3 | 82.0 | 83.9 | 84.0 | 84.0 | 84.4 |
| **Унгария** | 63.8 | 68.0 | 71.0 | 71.3 | 67.3 | 67.3 | 67.8 | 67.1 | 71.0 |
| **Чехия** | 61.8 | 63.3 | 63.0 | 66.6 | 68.0 | 68.6 | 69.3 | 71.5 | 71.9 |

Източник: Евростат.

В периода на преход и европейска интеграция България постигна значителен напредък и в реалната конвергенция на доходите, като основни причини бяха високият растеж, доверието във функциониращия режим, привличането на ПЧИ, но въпреки това страната продължава да се намира на последно място по БВП по СПС в ЕС, което налага повишаване на производителността на труда чрез повече инвестиции в нови технологии и в образование и повишаване на квалификацията.

## *3. Допълнителни фактори (според ДФЕС)*

3.1. Платежен баланс

Държавите с ПС и фиксирани валутни курсове натрупаха значителни дефицити най-вече по текущите сметки на платежните си баланси в периода на преход и икономическа интеграция в ЕС. Основна причина за това е невъзможността за адаптиране на платежния баланс чрез промяна във валутния курс, ниската конкурентоспособност на икономиките и силното нарастване на местното търсене.

През разглеждания период България бе с най-висок дефицит по текущата сметка от всички държави-кандидатки от ЦИЕ. Нарастващият относителен дял на ПЧИ от БВП през периода 2005–2008 г. в голяма степен покриваше огромните дефицити по текущата сметка, тъй като значителна част от инвестициите не бяха насочени директно към производството, а към сектора на финансовите услуги и недвижимите имоти и следователно имаха ограничено непосредствено влияние върху износа. Подобно бе положението и в Литва, Латвия и Естония. През 2007 г. и 2008 г. дефицитът по текущата сметка на платежния баланс достигна най-висок размер – 25% от БВП на страната. Началото на световната икономическа криза доведе до забавяне и спад на външната търговия. Само през първите девет месеца на 2009 г. дефицитът по текущата сметка на платежния баланс намаля с 63.9% спрямо същия период на предходната година, като износът спадна с 26.6%, а вносът – с 35.4%. През 2008 г. притокът на ПЧИ достигна 6.55 млрд. евро (19.5% от БВП), а през 2009 г. намаля до 9.5% от БВП. Основен двигател на растежа на външния дефицит през годините бе дефицитът в търговския баланс поради силното повишаване на местното търсене и големия приток на ПЧИ. Трябва да се отбележи обаче, че въпреки външния дисбаланс и постепенното обезценяване на лева сериозна опасност за стабилността на режима не съществува поради натрупаните значителни фискални резерви. Положителна тенденция се забелязва при дела на спестяванията, който нараства след 2006 г. и през 2009 г. достигна почти 18% от БВП.

През последните години България натрупа значителен външен дълг предимно в евро, като за периода 2004–2009 г. той нарасна от 64% до 111% от БВП най-вече поради увеличаването на частния дълг, докато публичният външен дълг намаля благодарение на фискалната дисциплина. Част от дълга всъщност са ПЧИ, като делът на вътрешнофирмените заеми в общия размер на външния дълг се повишава до 39.1% към април 2010 г. спрямо 37.6% година по-рано. В матуритетната структура на дълга обаче преобладава дългосрочният дълг, което подчертава дългосрочния ангажимент на чуждестранните собственици на местни предприятия.

Таблица 16

**САЛДО ПО ТЕКУЩАТА И КАПИТАЛОВАТА СМЕТКА КАТО ДЯЛ ОТ БВП**

(%)

| | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| **Текуща сметка** | -12.4 | -18.4 | -26.8 | -24.0 | -9.4 |
| **Търговско салдо** | -20.2 | -22.0 | -25.1 | -25.2 | -12.1 |
| **Текуща и капиталова сметка** | -11.3 | -17.7 | -28.9 | -23.2 | -8.0 |

Източници: БНБ, ЕЦБ, Евростат.

Икономическата криза доведе до намаляване на съществуващите външни дефицити във всички държави-членки от ЦИЕ. В държавите с инфлационно таргетиране растежът бе по-плавен, инфлацията по-ниска, нарастването на търсенето по-слабо, а местните валути се обезцениха и това не доведе до натрупването на значителни външни дисбаланси, което спомага за по-бързото възстановяване от кризата.

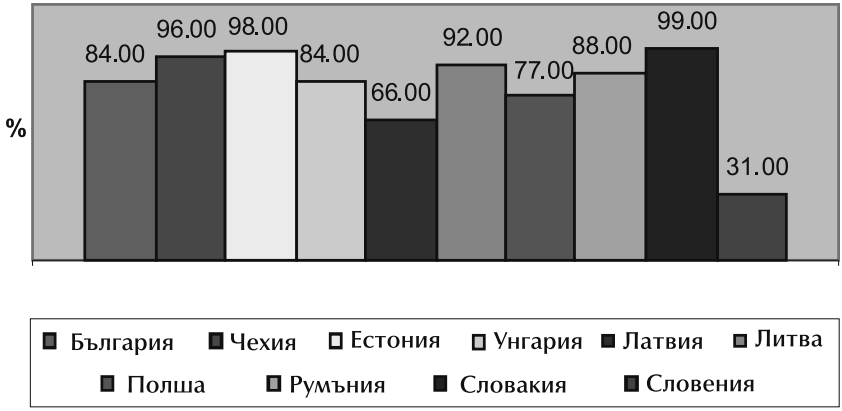
Натрупаните от България външни дисбаланси в периода преди кризата бяха резултат от модел на икономическо развитие, който доведе до големи дефицити по текущата сметка на платежния баланс. Кризата съществено повлия върху състоянието на текущата сметка и за намаляване на дефицита, налагайки промяна в модела на растеж.

3.2. Финансова интеграция

Характерна особеност на страните от ЦИЕ е наличието на малък по размер финансов пазар и по-слабо развита финансова система в сравнение с държавите от еврозоната. Понастоящем финансовите сектори на държавите от ЦИЕ са добре интегрирани във финансовата система на ЕС. Един от основните канали на интеграция представляват банковата система и високият дял на активите, притежавани от чужди банки. В държавите от ЦИЕ над 70% от банковите активи са собственост на банки-майки от ЕС (предимно от Австрия, Германия, Италия и Франция), а пазарният дял на петте най-големи банки в тези държави е по-висок, отколкото в еврозоната. Банковият сектор на държавите от ЦИЕ е тясно свързан и силно зависим от развитието на банките-майки. В условията на световна финансова криза възникналите проблеми в банките-майки бързо се разпространиха в региона, създавайки нестабилност в банковия сектор на много държави (Унгария, Румъния, Латвия).

Графика 3

**ДЯЛ НА АКТИВИТЕ НА ЧУЖДЕСТРАННИ БАНКИ В БАНКОВИЯ СЕКТОР В ЦИЕ-10 ПРЕЗ 2008 г.**




Източник: ЕБВР.

Световната икономическа криза започна с т.нар. небанкова банкова криза по определението на Кругман[29], като ефектите от нея, пренесени от банковия сектор върху реалната икономика, са изключително силни в онези държави и икономически общности, в които банките са ключови играчи във финансовата система. Много подходящ пример в това отношение е еврозоната, в която липсата на общи регулации за финансов надзор, ефективни инструменти за идентифициране на рискове и предотвратяване на кризи бе в основата на финансовата и икономическата криза.

Основна причина за ускореното развитие на банковия сектор в балтийските държави и България бяха проведените парични реформи през 90-те години на миналия век и установените фиксирани валутни курсове. Изследвания[30] в балтийските държави показват, че кредитната експанзия, стимулирана от финансовата интеграция, бе много бърза и не бе основана на фундаментални предпоставки. Основните фактори, повлияли върху кредитния бум, бяха растежът на реалния БВП, по-високата инфлация и

[29] *Кругман, П.* Завръщането на икономиката на депресията и кризата от 2008 г. С.: Изток-Запад, 2009.

[30] Cross country study. Economic policy challenges in the Baltics, European Commission, Occasional papers 58/February 2010.

финансовата либерализация. Акумулираните по време на бума дисбаланси се проявяват при: нарастване на лихвените равнища; корекция в цената на активите; привнесен отвън икономически шок (напр. чувствителен спад на износа) или обрат в краткосрочните капиталови потоци, предизвикан от промяна в инвеститорското доверие.

Финансовата криза създаде предпоставки за повишена уязвимост на финансовия сектор на редица държави от ЦИЕ вследствие на бързата кредитна експанзия (особено в процъфтяващия сектор на недвижимите имоти), нарасналия дял на заемите за домакинствата и нефинансовите предприятия, деноминирани в чужда валута (предимно в евро), и влошаването на качеството на кредитите. Кредитният растеж в тези държави бе поддържан не само от местната кредитна експанзия, но и от увеличеното трансгранично финансиране (напр. в балтийските държави, които станаха твърде зависими от развитието на външната среда). Във всички държави от региона нарасна делът на необслужваните от фирмите и домакинствата кредити поради проявлението на комбинирания ефект от по-ниското качество на заемите и по-ниския темп на годишно нарастване на кредитите. Преди кризата делът на лошите кредити в отделните държави варираще, като в периода от 2005 г. до средата на 2008 г. бе между 3% и 5% от всички кредити. Рязко нарасна и делът на необслужваните кредити в България през 2009 г. В периода януари 2009 г. – януари 2010 г. те бяха почти 14% от обема на редовните кредити. Статистиката на БНБ показва, че през февруари 2010 г. лошите заеми са достигнали 4.730 млрд. лв., като размерът на редовните е 33.973 млрд. лв.

Кредитният канал в еврозоната и във всички останали държави в ЕС бе много сериозно повлиян от кризата, а възстановяването на кредитната дейност е от първостепенно значение за развитието на бизнеса и производството.

Процесът на конвергенция на лихвените равнища зависи от степента на финансова интеграция на държавата със страните от еврозоната, както и от достъпа на местните търговски банки до високоликвидния пазар в Съюза. При сравнение между лихвените равнища в еврозоната и в България в периода преди и след началото на световната икономическа криза се забелязва наличието на съществен лихвен диференциал както при депозитите, така и при кредитите, но в същото време тенденциите в кредитирането

са сходни. Въпреки ограниченото кредитиране и затягането на кредитните условия банковата система в страната остава стабилна поради последователната антициклична позиция на БНБ, която позволи да бъдат натрупани капиталов ресурс и ликвиден потенциал за посрещане на кризата.

В периода на световна финансова криза българската банкова система не изпитваше ликвидни затруднения, но несигурната вътрешна и външна икономическа среда рефлектираха върху поведението на банките. В България не съществуват индикации за дестабилизация на финансовата система, което е важна предпоставка за по-бързото излизане на страната от кризата. Системата през 2009 г. продължи да генерира печалби, а капиталовите буфери гарантираха съотношение на обща капиталова адекватност значително над консервативния минимум от 12%, изискван от българското законодателство. Коефициентът на ликвидност продължи да надхвърля 20% и за разлика от много други страни в ЕС не бяха налице никакви основания за тревога по отношение на ликвидния риск независимо от частичното влошаване на кредитния портфейл.

Стабилността на банковата система се потвърждава и от резултатите от стрес-теста на европейските банкови групи, представени и в България, които са участвали в общоевропейския тест за устойчивост на банковата система. Резултатите на българската банкова система към 30 юни 2010 г. показват, че управлението на основните рискове е адекватно както на ниво система, така и при отделните кредитни институции. Размерите на ликвидната и капиталовите позиции гарантират извършването на банковите плащания и поддържането на буфери в системата. Съотношението на ликвидните активи към сумата на пасивите е 22.14% (при 22.26% в края на март). Показателят за обща капиталова адекватност е 18.03% (при 18.24% три месеца по-рано)[31].

Следва да се отчитат обаче продължаващата висока степен на несигурност на средата, опасностите, произтичащи от намалелите възможности за натрупване на буфери по линия на доходността, и влошаващият се икономически профил на част от потребителите на банкови услуги. Местните източници за финансиране на банковите операции остават стабилни и в

[31] Състояние на банковата система към 30 юни 2010 г., БНБ: www.bnb.bg.

края на юни 2010 г. осигуряват малко над 3/4 от общата сума на привлечените средства в системата. Тенденцията към забавяне на темповете на растеж на кредита в страната продължава под влияние на слабата икономическа активност, високата несигурност и затягането на кредитните стандарти на банките, което ограничава търсенето на кредити. В същото време в условията на криза делът на спестяванията нараства за сметка на намаляващите инвестиции. Домакинствата станаха по-предпазливи и спестяват повече, като през 2009 г. делът на спестяванията достигна 18% от БВП.

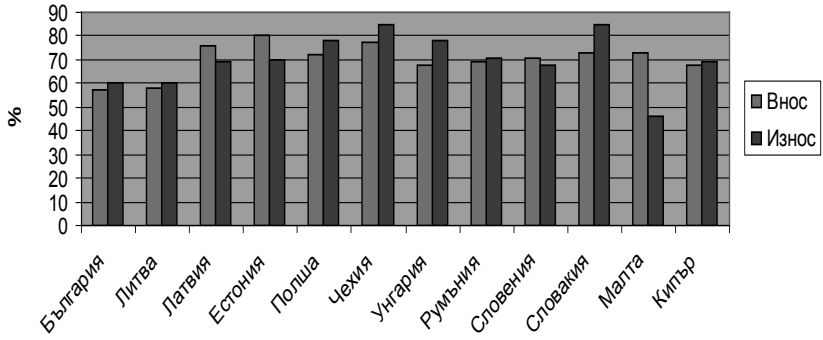
3.3. Търговска интеграция

Оценката за степента на отвореност на икономиките (или степен на търговска интеграция) се базира на тенденциите в развитието на търговията с държавите от ЕС вследствие на нейното либерализиране и достъпа до вътрешния пазар. Данните показват висока степен на отвореност на икономиките от ЦИЕ към ЕС. Голяма част от тези държави са постигнали степен на търговска интеграция над средната стойност за ЕС (67.4% през 2008 г.). По отношение на вноса в ЦИЕ може да се направи извод, че отново преобладаващ дял се пада на държавите от ЕС, като стойностите се колебаят между 57% (в България) до 80% (в Естония). За сравнение средната стойност на този показател за ЕС бе 62% през 2008 г. Държавите с инфлационно таргетиране от ЦИЕ се отличават с по-висока степен на търговска интеграция с ЕС в сравнение с държавите с фиксирани курсове, за което допринесе ориентацията на икономиките към експорт и по-високата конкурентоспособност.

Търговията бе най-важният канал за разпространение на кризата за повечето държави от региона в резултат от задълбочаването на търговската интеграция с ЕС. За различните държави спадът в търговията зависи от степента на отвореност на икономиката и търговската им специализация.

Графика 4

**ДЯЛ НА ТЪРГОВИЯТА НА НОВИТЕ ДЪРЖАВИ-ЧЛЕНКИ С ЕС ПРЕЗ 2008 г.**




Източник: Евростат.

Кризата засегна силно търговията на България, като през 2009 г. вносът намаляваше с по-бързи темпове, отколкото износът, а през първата половина на 2010 г. на годишна база търговията се интензифицира, като се наблюдава изпреварващ темп на растеж на износа спрямо вноса. Основна причина за тази тенденция е началният процес на възстановяване на икономиките на основните търговски партньори на страната при продължаващо слабо местно търсене.

## II. Предизвикателства пред членството на България в еврозоната в условията на икономическа криза

### *1. Смяна на модела на икономически растеж*

Понастоящем основното изпитание за България и държавите с фиксирани курсове от ЦИЕ е необходимостта от смяна на модела на икономическо развитие, следван преди кризата. Добрите резултати в номиналната и реалната конвергенция на тези държави преди кризата не можаха да осигурят сигурна защита срещу нея[32]. Перспективите за връщане към основните източници на растеж

[32] The impact of the global economic and financial crisis on Central, Eastern and South-Eastern Europe, ECB, Occasional paper, June 2010.

от периода преди кризата съществено се различават в отделните държави, като за България те не изглеждат реалистични.

Кризата налага извършването на фундаментални промени в модела на растеж в България, за да не се допуснат отново големи макроикономически дисбаланси. България трябва да създаде предпоставки за повишаване на конкурентоспособността на икономиката и развитие на търгуемия сектор. В средносрочен план очакванията са, че растежът ще бъде много по-нисък от този преди кризата, което неминуемо ще окаже неблагоприятно влияние върху състоянието на държавната бюджетна позиция, но ще има позитивен ефект върху равнището на инфлацията. Същевременно това ще доведе до намаляване на дефицита в платежния баланс, обаче ще забави реалната конвергенция. Основни причини могат да се търсят в затрудненията условия за външно финансиране и по-високата рискова премия отчасти заради ефекта на изтласкване на частни инвеститори (*crowding out)* при голямото нарастване на държавния дълг на развити икономики, по-ниския потенциален растеж на ЕС-15, което ще намали външното търсене на продукти от региона, производителността на труда, която се повишава бавно, и по-слабото местно търсене.

За България очакванията са, че през 2010 г. основен източник на икономически растеж ще бъде нетният износ. Почти две трети от износа са насочени към държави – членки на ЕС, което показва колко е важно за икономиката възстановяването на ЕС. Основните рискове за растежа са свързани с евентуално влошаване на финансирането на филиалите на банките от страна на банките-майки при нови сътресения на световните финансови пазари, както и от евентуално задълбочаване на дълговата криза в еврозоната. Анализите на БНБ показват, че понастоящем устойчивостта на формираните положителни тенденции е слаба и несигурна, като последиците от дълговата криза в еврозоната до момента не влияят пряко върху краткосрочните перспективи за икономическия растеж, но пораждат несигурност и рискове за възстановяването на глобалната икономика и за скоростта на възстановяване на българската икономика[33].

Повече от две десетилетия производственият потенциал и сравнителните предимства на българската икономика не бяха използвани в достатъчна степен, а членството в ЕС и участието в

[33] Икономически преглед, 2010, кн. 2, с. 6.

единния вътрешен пазар дават огромни възможности за развитие на износа на български стоки. Българската икономика разполага с потенциал и производствени фактори за развитие на търгуемия сектор и специализация във вътрешния пазар на ЕС.

В контекста на предложената от Европейската комисия стратегия „Европа 2020“[34] българското правителство определи национални цели[35], чието изпълнение обаче зависи от осигуряването както на публични средства, така и на финансови ресурси от частния сектор, което е свързано не само с допълнителни улеснения за правене на бизнес, но и като цяло с промяна в поведението и навиците на голяма част от съществуващия вече бизнес в страната. Важно е развитието на публично-частни партньорства, които да спомогнат за реализацията на значими инвестиционни проекти и преодоляването на регионалните различия в страната. В периода 2010–2020 г. трябва да се извърши преструктуриране на българската икономика в посока към по-висока интензивност на иновациите.

Необходимо е подобряване и на бизнес средата, ограничаване на сивата икономика в страната, напр. посредством намаляване на административната тежест върху бизнеса, включително и чрез развитие на електронните административни услуги. В Конвергентната програма[36] са приведени разчети, според които намаляването на административната тежест върху бизнеса в България с 20% би довело до нарастване на БВП с 1.44% до 2025 г.

Важен източник на финансови средства за постигане на икономическо и социално сближаване са структурните фондове, Кохезионният фонд, а също така и Европейският земеделски фонд за развитие на селските райони и Европейският фонд за рибарство. Финансовата подкрепа за развитие на икономиките може да стимулира номиналната и реалната конвергенция посредством развитието на транспортната, екологичната, комуникационната инфраструктура, повишаването на заетостта, обучението и квалификацията, инвестициите в иновации и в технологично развитие на малките и средните предприятия, повишаването на атрактивността на по-слабо развитите райони за работа и живот.

[34] „Европа 2020“ – Стратегия за интелигентен, устойчив и приобщаващ растеж, ЕК, март 2010.

[35] Позиция на Република България относно определяне на национални цели по стратегията „Европа 2020“.

[36] Конвергентна програма 2009–2012 г., януари 2010.

Повишаването на ефективността в усвояването на европейски средства ще даде възможност за по-бързо преодоляване на голяма част от трудностите, особено в периода на икономическа криза, и може да ускори процеса на възстановяване на местната икономика, което представлява ключова предпоставка за изпълнение на критериите за приемане на общата валута. През 2009 г. Полша беше единствената държава – членка на ЕС, чиято икономика отбеляза растеж, а и съществен принос за този успех има доброто усвояване на средства по европейските фондове. Най-високо е равнището на договорените средства в Словения и Полша – съответно 55% и 54%, а в България и Румъния е най-ниско – 48% и 45%. Най-голям е делът на реално усвоените средства в Естония (25.7%), Литва (25.8%), Латвия (20.2%), следвани от Полша (16.5%).

Таблица 17

**РАВНИЩЕ НА ДОГОВОРЕНИТЕ СРЕДСТВА, НА РЕАЛНО УСВОЕНИТЕ СРЕДСТВА И НА ИЗПЪЛНЕНИЕ В ЦИЕ-10 КЪМ ЮНИ 2010 г. ЗА ПЕРИОДА 2007–2013 г.**

(%)

| ДЪРЖАВИ | РАВНИЩЕ НА ДОГОВОРЕНИТЕ СРЕДСТВА* | РАВНИЩЕ НА РЕАЛНО УСВОЕНИТЕ СРЕДСТВА** | РАВНИЩЕ НА ИЗПЪЛНЕНИЕ*** |
|---|---|---|---|
| **България** | 48 | 11.2 | 3 |
| **Естония** | 50 | 25.7 | 33 |
| **Латвия** | 50 | 20.2 | 21 |
| **Литва** | 50 | 25.8 | 32 |
| **Полша** | 54 | 16.5 | 13 |
| **Румъния** | 45 | 10.4 | 2 |
| **Словакия** | 51 | 13.6 | 8 |
| **Словения** | 55 | 16.4 | 13 |
| **Унгария** | 53 | 15.7 | 12 |
| **Чехия** | 53 | 14.8 | 10 |

* Равнище на договорените средства – съотношението на определените за държавата средства към отпуснатите средства.

** Равнище на реално усвоените средства – съотношение на направените плащания към разпределените средства.

*** Равнище на изпълнение – съотношение на последващите възстановени плащания към договорените средства.

Източници: ЕК, Световна банка.

За периода 2007–2013 г. повече от половината от средствата от бюджета на ЕС са предназначени за десетте държави-членки от ЦИЕ, като средногодишното разпределение на средствата по цел

„сближаване“ достига 3% от БВП на съответните държави-членки. След петото разширяване на ЕС на 1 януари 2007 г. регионалните различия в Съюза силно нараснаха и се задълбочиха. По данни на Евростат, публикувани през февруари 2010 г., повече от един регион на всеки седем в ЕС е имал над 125% от средния за ЕС БВП на човек от населението (41 региона), като в новите държави – членки на ЕС, има само по един в Чехия и в Словакия. В същото време в един на всеки четири региона БВП на човек от населението е бил под 75% от средния за ЕС, а най-ниските стойности са отчетени в България и Румъния: съответно в Северозападен район в България (26% от средния) и в Североизточен район в Румъния и в Северен централен и Южен централен район в България (27%).

Размерът на отпуснатите от бюджета на ЕС средства на човек от населението е най-малък за България (800 евро), а най-голям за Естония (2600 евро) и Чехия (2600 евро). Съществува опасност обаче за следващия програмен период тези средства да намалеят, ако България не е в състояние ефективно да ги усвоява, а това ще означава изоставане и загуба на възможности за наваксване и развитие. Данните, публикувани от правителството за изпълнение на оперативните програми, показват, че от бюджет за периода 2007–2013 г. в размер на 8 019 197 650 евро (финансиране от ЕС – 6 673 628 244 евро, и национално съфинансиране – 1 345 569 406 евро) към 31 юли 2010 г. са договорени около 35% от средствата, а реално изплатените суми са едва 7.28% от тях.

Усвояването на средства по европейските фондове може да помогне за смекчаване влиянието на икономическата криза върху бюджетните позиции, тъй като ефектите от инвестициите в заетостта, производството и инфраструктурата неминуемо ще доведат до нарастване на приходите в бюджета и намаляване на публичните разходи за социални и благоустройствени дейности и за дългосрочна устойчивост на бюджетната позиция. Ролята на финансирането от европейските фондове на държавите от ЦИЕ за излизане от кризата и догонване на развитите икономики се потвърждава в доклада на Световната банка[37], в който се посочва, че европейската политика на сближаване подкрепя бюджетната стабилност и публичните инвестиции в региона в период на сериозен натиск върху бюджетните позиции.

[37] EU 10: Regular economic report – Main report Safeguarding recovery, Focus notes: Absorption of EU funds, World bank, July 2010.

Спазването на бюджетна дисциплина в страната е задължително условие и с оглед на появилите се предложения в ЕС за налагането на санкции на държавите, неспазващи разпоредбите на ПСР, на които ще бъдат спирани средствата по фондовете на ЕС. Съгласно съществуващите разпоредби финансовата помощ от Кохезионния фонд може да бъде спряна с решение на Съвета, ако дадена държава има прекомерен публичен дефицит, ако не е преодоляла това положение или ако предприетите действия се окажат неадекватни, но такива санкции до момента не са налагани[38].

Оценките на експерти на ЕК показват, че политиката на сближаване в България може да допринесе съществено за общия растеж на БВП, изчислен на 15% до 2020 г., като БВП на човек от населението може да достигне 51% от средния за ЕС, равнището на заетост да се повиши до 64%, а разходите за научноизследователска и развойна дейност да нараснат до 1.15% от БВП през 2013 г. Ефектите върху икономиката се оценяват на базата на изразходваните средства и могат да се реализират само при цялостното им усвояване.

Таблица 18

**ВЛИЯНИЕ НА СРЕДСТВАТА, ОТПУСНАТИ ПО ФОНДОВЕ НА ЕС В БЪЛГАРИЯ**

| ПОКАЗАТЕЛ | ЕФЕКТ СРЕДНО ЗА ПЕРИОДА 2007–2013 г. |
|---|---|
| **Растеж на БВП (пр.п.)** | 0.27 |
| **Инвестиции в производството (пр.п.)** | 0.79 |
| **Индекс на потребителските цени (пр.п.)** | 0.09 |
| **Растеж на износа на стоки (пр.п.)** | 0.46 |
| **Растеж на износа на услуги (пр.п.)** | 0.25 |
| **Салдо по текущата сметка (млн. евро)** | 409.7 |
| **Заетост (хил. души)** | 36.7 |

Източник: Национална стратегическа референтна рамка.

[38] Регламент (ЕО) № 1084/2006 на Съвета от 11 юли 2006 година за създаване на Кохезионен фонд и за отмяна на Регламент (ЕО) № 1164/94.

Европейската политика на сближаване може да има по-голяма роля в подкрепа на действията на държавата за справяне със структурните слабости и предизвикателствата на конкуренцията, но това изисква засилване на институционалния капацитет и ефективността на публичната администрация. В дългосрочен план реалното сближаване на България с развитите европейски държави може да се ускори само ако страната разполага с необходимия административен капацитет и постигне висока степен на прозрачност и отчетност в процеса на изразходване на финансовите средства. Много важно е наличието на капацитет и в частния сектор за подготовка и реализация на проекти.

## *2. Устойчиво изпълнение на критериите за държавна бюджетна позиция*

За България стриктната бюджетна политика и дисциплина са от първостепенна важност за поддържане на макроикономическата и фискалната стабилност, за по-бързо възстановяване от кризата чрез засилване на доверието на чуждите инвеститори в икономиката и за нормалното функциониране на финансовата система. Състоянието на бюджета налага осъществяването на ефективни дългосрочни реформи в редица ключови сфери и консолидирането му, но всичко това не е възможно без ясна визия за развитие на икономиката. Задължително обаче трябва да се отчетат и неблагоприятните ефекти от ориентирането на растежа на базата на износа, което е свързано с по-ниски данъчни приходи в бюджета, а това изисква промени в данъчната система и нарастване ролята на други източници на приходи в бюджета.

На 12 май 2010 г. ЕК публикува своя доклад относно процедурата при прекомерен дефицит за България[39], в който заключи, че прекомерният дефицит „може да се окачестви като извънреден, тъй като се дължи на драстичен икономически спад" вследствие на световната икономическа и финансова криза. Освен това тя приема, че дефицитът е временен, ако спадне под 3% от БВП през 2010 г. България не изпълнява критерия за дефицит, а резултатите за 2010 г. зависят изключително от възстановяването на икономиката и мерките и действията за ограничаване на разходите. През юли Съветът започна процедура при прекомерен

[39] Report from the Commission: Bulgaria, Report prepared in accordance with Article 126 (3) of the Treaty, Brussels, 12 May 2010.

дефицит за България.[40] Съветът определи срок за намаляването му под 3% от БВП по „надежден и устойчив начин" най-късно до 2011 г. Основен приоритет за българското правителство е бюджетната консолидация, насочена към постигане на средносрочната цел за балансиран бюджет, която трябва да се поддържа и след коригирането на прекомерния дефицит.[41] Корекцията на бюджетния дефицит може да се осъществи чрез структурни реформи и ограничаване нарастването на заплатите в публичния сектор, повишаване на производителността на труда и подобряване на конкурентоспособността. Намаляването на дефицита би могло да се осъществи и чрез повишаване на данъчните ставки, но това вместо да подобри приходната част на бюджета, може да стимулира укриването на доходи и печалби, да затрудни бизнеса и производството, да влоши бизнес климата и привлекателността на страната за чуждестранните инвеститори, да ограничи потреблението и в крайна сметка да забави възстановяването на икономиката.

В резултат на значителното влошаване на бюджетното салдо от началото на 2010 г. се наложи актуализация на Закона за държавния бюджет за 2010 г. В приетите изменения и допълнения на Закона за държавния бюджет на Република България се предвижда дефицит на касова основа по консолидираната фискална програма за годината от 3.3 млрд. лв. (4.8% от БВП), както и използване на средства от фискалния резерв, чийто минимален размер ще бъде намален от 6.3 млрд. лв. на 4.5 млрд. лв. Дефицитът на начислена основа, използван за оценката на номиналната конвергенция, ще бъде 3.8% от БВП, т.е. свръхдефицит ще има и през 2010 г., което неминуемо отлага изпълнението на критерия и съответно членството в еврозоната.

Провеждането на структурни реформи ще окаже положително влияние за оптимизиране и повишаване ефективността на бюджетните разходи. Реформите в пенсионната система, здравеопазването, образованието и администрацията изискват време, дългосрочна визия и последователност. Те влияят пряко

[40] Commission opinion on the existence of an excessive deficit in Bulgaria, 6 July 2010.

[41] Bulgaria – Commission assessment in relation to the Commission proposal for a Council decision on the existence of an excessive deficit (art. 126(6) of the Treaty) and the Commission recommendation for a Council recommendation to end the excessive deficit situation (art. 126(7) of the Treaty), 6 July 2010.

върху състоянието на бюджета и косвено върху икономическото развитие, тъй като дават възможност бюджетни средства да бъдат пренасочени за реализацията на инфраструктурни проекти, научноизследователска и развойна дейност и за социални разходи.

Основен приоритет на всяка държава-членка е осигуряване на устойчивостта на фискалната позиция, което е важна предпоставка за макроикономическата и финансовата стабилност в дългосрочен план. Концепцията за устойчивост на публичните финанси[42] се отнася за способността на правителството да финансира своя текущ дълг и очакваните разходи. Фискалните разходи[43], свързани с кризата, и очакваното демографско развитие[44] представляват голямо изпитание за фискалната устойчивост на всички държави-членки.

В Доклада за устойчивост на публичните финанси за 2009 г. България е сред малкото страни в ЕС, за които съществува нисък риск по отношение на дългосрочната устойчивост на публичните финанси, като за това допринасят излишъците в структурния първичен баланс, който допринася за намаляване на дълга. Това обаче ще продължи само ако резултатите от бюджетната политика се запазят през следващите години. В България ръстът на разходите (през 2060 г. – 3.2%), свързани със застаряването на населението, се очаква да бъде под средния за ЕС (4.6%) и еврозоната (5.1%).

За България стриктната фискална политика представлява основна предпоставка за поддържане на макроикономическата и финансовата стабилност, за справяне с проблемите с прекомерния дефицит и изпълнение на критерия за бюджетен дефицит, което ще осигури устойчивост на фискалната позиция и в дългосрочен план. Всичко това ще спомогне за сближаването с развитите икономики от ЕС.

[42] Sustainability report 2009, European Commission.

[43] Първата група разходи включват основно: социални разходи; финансови средства за банковата система; разходи за подкрепа на производството и др.

[44] Демографските разходи са обусловени главно от влошаването на възрастовата структура на населението – намаляване на броя на хората в трудоспособна възраст и увеличаване на броя на пенсионерите.

### *3. Засилване на наблюдението и контрола от страна на европейските институции*

Промените, въведени с ДФЕС, целят да осигурят необходимите за бъдещото функциониране на ИПС икономически и политически предпоставки и условия, тъй като слабата координация и наблюдение върху управлението на икономиката и публичните финанси в еврозоната бяха факт от самото начало на функционирането ѝ. В ДФЕС е регламентирана необходимостта от по-тясна координация на икономическите политики на държавите-членки, която включва многостранно наблюдение от Съвета върху икономическото развитие на всяка държава в съответствие с общите насоки и редовно изготвяне на оценка. При наличието на риск, застрашаващ функционирането на ИПС, ЕК отправя предупреждение към съответната държава-членка. По предложение на ЕК Съветът отправя препоръки към държавата – превантивна мярка, която трябва да бъде използвана при появата на първоначални индикации за проблеми в икономиката, водещи до дисбаланси на макроравнище. По този начин не трябва да се допуска преносът и разпространението им в останалите икономики от Съюза. При неизпълнение на критерия за дефицита и/или дълга действат разпоредбите, свързани с процедурата при прекомерен дефицит. Важно е да се отбележи обаче, че за държавите извън еврозоната принудителни мерки за коригиране на бюджетния дефицит, т.е. санкции, не трябва да се налагат.

Последиците от дълговата криза в еврозоната изостриха чувствителността на институциите към проблемите с дефицита и дълга в държавите-членки и затова министрите на финансите на държавите от ЕС решиха в бъдеще да се приемат и нови санкции срещу задлъжнелите страни, които да се прилагат дори преди бюджетният дефицит в дадена държава да е достигнал границата от 3% от БВП, както и когато държавният дълг започва бързо да нараства. Лансират се идеи санкции да бъдат налагани на всички държави – членки на ЕС, а не само на тези от еврозоната. Това, от една страна, ще стимулира държавите да провеждат благоразумна фискална политика и да поддържат бюджетна дисциплина, но от друга, за голяма част от държавите извън еврозоната това ще бъде голямо изпитание на фона на протичащите реформи в основни сфери на икономическия и социалния живот. Кризата направи европейските институции по-безкомпромисни към кандидатките за еврозоната по отношение изпълнението на номиналните критерии

(особено този за държавната бюджетна позиция), а наблюдението става по-стриктно.

Засилването на икономическата координация в ЕС е на преден план в дейността на Комисията[45], а постигането на по-интегрирано наблюдение на икономическите политики бе заложено и в стратегията „Европа 2020". От 1 януари 2011 г. започна нов надзорен цикъл – „европейски семестър" за координиране на икономическата политика, който има за цел ранно съгласуване на европейско равнище, още когато държавите подготвят своите национални конвергентни програми, включително бюджетите и програмите за реформи. Тази мярка трябва да засили превантивната функция на ПСР и се очаква да допринесе за възстановяване на бюджетната дисциплина в Съюза. Към всяка държава ще бъдат отправяни препоръки във всички аспекти на наблюдението – фискални, макроикономически, финансови и структурни. Това би трябвало да помогне на недисциплинираните държави-членки да предприемат коригиращи мерки, за да постигнат целите на ДФЕС и ПСР, но в същото време ще изисква много добро взаимодействие на националните и европейските институции. Промени настъпват и по отношение на сроковете за представяне на конвергентните програми, които трябва да бъдат изпращани през първото шестмесечие на годината, а не в края на годината, както понастоящем. Докладването и оценката по тях и по програмите за структурни реформи за първи път ще се извършват едновременно, а това означава и да се представят по едно и също време, което практически обвързва постигането на напредък по стратегическите цели за растежа със структурните реформи и стабилната бюджетна позиция.

Може да се допусне, че за България засилването на наблюдението и координацията от страна на европейските институции ще стимулира ефективността и прозрачността в действията на националните институции, които ще трябва да докажат капацитет и възможности да отговорят на изискванията и очакванията на европейските институции, както и да подобрят комуникацията и взаимодействието си с тях.

[45] Communication from the Commission: Reinforcing economic policy coordination, COM 2010/250, Brussels, May 2010.

### *4. Позиции на ЕЦБ и ЕК относно разширяването на еврозоната*

Изпитанията пред функционирането на ИПС, произтичащи от последиците от рецесията, дълговата криза и кризата в управлението на еврозоната, оказват силно влияние върху позициите на европейските институции и на държавите от еврозоната относно приемането на нови членове. В настоящите условия европейските институции втвърдяват все повече своите позиции относно допускането на нови членки, а справянето с последиците от кризата в еврозоната е неотложен приоритет, който оставя на заден план нейното разширяване. Въвеждането на еврото в Словения, Словакия, Малта и Кипър се осъществи в период на икономически растеж и финансова стабилност в ЕС и ИПС, които безспорно се отразиха благоприятно върху решенията за приемането им в еврозоната. Естония е и вероятно ще остане единствената държава, която приема еврото в периода на криза, доказвайки, че може да се справи успешно с трудностите и в лоши за икономиката времена. Процесът на разширяване ще продължи едва след решаването на настоящите проблеми в еврозоната.

В последните доклади на ЕЦБ и ЕК за конвергенцията договорните критерии за членство в еврозоната се интерпретират и прилагат по различен начин за новите държави – членки на ЕС. Икономическите и политическите предизвикателства пред еврозоната се превръщат в сериозен източник на трудности в процеса на подготовка на държавите от ЦИЕ за въвеждане на еврото. В този смисъл завършването на процеса на парична интеграция зависи изключително от решаването на проблемите в еврозоната.

## III. Възможности и перспективи за приемане на еврото в България в периода на криза

### *1. Възстановяване на националната и европейската икономика*

Изключително важно влияние върху процеса на подготовка на България за присъединяване към еврозоната имат темпът и скоростта на възстановяване както на националната, така и на европейската икономика. Основна причина за това е фактът, че България има сравнително малка и отворена икономика, в която местната валута е с фиксиран курс към еврото.

През юли 2010 г. Световната банка публикува данни за развитието на икономиките на десетте държави от ЦИЕ, които показват, че възстановяването на икономиките в региона вече е започнало, но българската икономика остава в рецесия поради слабото местно потребление и ограничените възможности за финансиране на бизнеса[46].

Данните на НСИ за първото шестмесечие на 2010 г. показват, че реалният спад на БВП е 2.5% спрямо същия период на 2009 г. Разходите за индивидуално потребление намаляват с 6.7%, а инвестициите в основен капитал – със 7.2%. Външнотърговското салдо е отрицателно (-6.2% от номиналния обем на БВП), но проявява тенденция към намаляване. В същото време износът на стоки и услуги се увеличава с 8.9%, а вносът на стоки и услуги продължава да намалява. Най-нисък е бил реалният спад на БВП през второто тримесечие на 2010 г. – с 1.4% спрямо същия период на предходната година, но икономиката остава в рецесия. Възстановяването на икономиките в ЕС и еврозоната, макар и слабо, вече е факт. Данните на Евростат показват, че през второто тримесечие на 2010 г. БВП в ЕС и еврозоната е нараснал с 1% на база първо тримесечие, когато растежът бе 0.2%. От държавите-членки от еврозоната Германия е отбелязала най-висок темп на растеж на БВП от 2.2%, като през първите 6 месеца на годишна основа той е 4.1%. Това е най-големият прираст на БВП за тримесечие, отбелязан след обединението на Германия, и е основан на износа и местното търсене. Интерес представлява също фактът, че най-висок растеж на база предходно тримесечие е отчетен в две държави извън еврозоната, които бяха сред най-тежко засегнатите от кризата – Литва и Естония, съответно 2.9% и 2.0%.

Несигурността относно бъдещите доходи и нарасналата норма на спестяване на домакинствата действат като фактори, ограничаващи нарастването на потреблението. Ключово значение за увеличаване на местното търсене има политиката по доходите на сектор „държавно управление". В основен приоритет в средносрочен план се превръща преодоляването на разликата между изпреварващия темп на нарастване на заплащането и доходите спрямо производителността на труда. Запазването на настоящия размер на минималната заплата, на пенсиите и текущите равнища на заплатите в администрацията обаче ще ограничи разходите

[46] Statistical annex, World bank, July 2010.

за потребление на значителна част от българите, което ще рефлектира негативно върху местното потребление, а оттам ще се отрази върху предлагането и растежа на БВП. Увеличаващият се износ едва ли би могъл да компенсира слабото местно търсене.

Скоростта на възстановяване на местната икономика зависи и от притока на ПЧИ в страната. Прогнозите на БНБ са за растеж през третото и четвъртото тримесечие на 2010 г., макар и по-малък, отколкото през съответния период на 2009 г.

Процесът на излизане от кризата и приспособяването на икономиката към новите външни условия могат да бъдат улеснени чрез структурни реформи, което ще доведе до по-ефективно използване на публични средства и осигуряване на устойчива бюджетна позиция в дългосрочен план.

Прогнозите на ЕК, МВФ и Световната банка за развитието на икономиката на ЕС показват, че през 2010 г. икономическата криза влияе силно върху всички държави-членки, а ефектите от нея ще бъдат осезаеми и през следващите няколко години. Растежът и инфлацията в еврозоната ще бъдат под 2% в средносрочен план, докато в ЦИЕ-10 темпът на растеж на БВП ще бъде по-висок от този в останалите държави, но по-нисък, отколкото преди кризата. Нарастването на цените на стоките и услугите обаче ще надвишава това в еврозоната, но инфлационният диференциал ще бъде по-малък в сравнение с периода преди рецесията. Според МВФ бюджетният дефицит в еврозоната за 2010, 2011 и 2012 г. ще намалява и ще бъде съответно -6.6%, -5.7% и -5.1%, т.е. стойностите ще надвишават границата от 3%. Публичният дълг ще продължава да нараства и през 2012 г. ще достигне 90% от БВП на еврозоната. Дълговата криза ще продължава да бъде най-голямото изпитание пред функционирането на паричния съюз[47].

Българското правителство ревизира прогнозите за основните макроикономически показатели за периода, като това се отнася най-вече за размера на бюджетния дефицит. Очакванията за растежа на БВП в периода 2011–2013 г. изглеждат оптимистични на фона на горепосочените тенденции в местната и европейската икономика, а съпътстващите негативни рискове не бива да се пренебрегват.

[47] Euro area policies 2010, IMF report, July 2010.

Таблица 19

**ПРОГНОЗНИ ДАННИ ЗА ОСНОВНИ ПОКАЗАТЕЛИ ЗА БЪЛГАРИЯ**

| Показатели | 2011 | 2012 | 2013 |
|---|---|---|---|
| **БВП – реален растеж (%)** | 3.6 | 4.7 | 4.9 |
| **ХИПЦ** | 3.6 | 3.5 | 2.7 |
| **Текуща сметка (% от БВП)** | -2.2 | -1.5 | -0.4 |
| **Приходи (% от БВП)** | 35.3 | 35.1 | 34.8 |
| **Разходи (% от БВП)** | 37.8 | 36.6 | 35.8 |
| **Бюджетно салдо (% от БВП)** | -2.5 | -1.5 | -1.0 |

Източник: МФ – Бюджетна прогноза за периода 2011–2013 г.

Възстановяването на българската икономика ще бъде трудно и бавно, а върху този процес пряко и косвено влияние имат множество вътрешни и външни фактори. Степента и силата на влияние на вътрешните фактори в много голяма степен зависят от провежданата в страната икономическа политика. Възстановяването на икономиките в региона и в ЕС вече започна въпреки продължаващата несигурност, а това би трябвало да стимулира в известна степен и българската икономика. Излизането от кризата обаче е невъзможно без възстановяване на местното потребление, притока на ПЧИ и възможности за финансиране на бизнеса.

## *2. Изпълнение на критерия за ценова стабилност*

Основни източници на инфлация в България през следващите години ще бъдат цените на енергоносителите и храните на световния пазар, т.е. външните източници на инфлация ще бъдат доминиращи, а промените в тях зависят от скоростта на възстановяване на икономиките от кризата. Излизането от рецесията и връщането към икономически растеж ще стимулират движение в цените, тъй като възстановяването ще интензифицира търговията между държавите и ще повиши потреблението на стоки в световен мащаб. Акцизните ставки на цигарите и алкохола вече се повишиха с оглед покриване на изискванията за хармонизиране в ЕС и не би трябвало да бъдат съществен източник на инфлация след 2010 г. През 2010 г. ЕК и МВФ прогнозират ниска, но положителна инфлация в страната, която ще остане над средната за ЕС и еврозоната.

Ефектите на икономическата криза осигуряват по-благоприятна възможност за постигане на критерия за ценова стабилност на основата на очакваните по-ниски темпове на икономически растеж и по-слабите вътрешно търсене и потребление през следващите години. Възможности за потискане на растежа на цените има по линия на ограничаване нарастването на вътрешното търсене и потреблението чрез запазване на сегашния размер на заплатите и пенсиите, задържане на административно определяните цени на сегашните равнища и поддържането на по-висока безработица в страната, което обаче би повлияло негативно върху темпа на растеж на производството и предлагането, а в средносрочен и дългосрочен период икономическият растеж ще бъде нисък. Това би създало трудности в изпълнението на критериите за приемане на еврото, защото ще допринесе за нарастване на бюджетния дефицит и съответно на държавния дълг, покачване на рисковата премия на държавните ценни книжа и проблеми с конвергенцията на дългосрочните лихвени проценти. В тази връзка потискането на инфлацията в страната не би било оправдано, тъй като негативните ефекти от това биха доминирали. Членството в еврозоната не може да бъде самоцел, а трябва да бъде резултат от наличието на макроикономически предпоставки и условия в страната.

### *3. Провеждане на стриктна фискална политика*

Режимът на ПС в България допринесе за поддържане на бюджетна дисциплина в страната и постигането на добри резултати в управлението на публичните финанси в периода 1998–2008 г. Добрата бюджетна позиция повиши и поддържа доверието на местните и чуждестранните икономически агенти в стопанското развитие на страната. Това се признава от МВФ, рейтингови агенции и европейските институции.

В процеса на парична интеграция водеща роля има политическият ангажимент за провеждане на благоразумна и стриктна фискална политика, ориентирана към постигане на критериите, което за България няма алтернатива. Примерът на Естония показва огромното значение на благоразумната фискална политика особено в лоши времена.

Стриктната фискална политика може да бъде провеждана и подкрепяна чрез използване на възможностите за финансиране от

европейските фондове и чрез намаляване на разходите в бюджета посредством структурни реформи.

### *4. Подобряване състоянието на платежния баланс*

Ориентацията на българската икономика към растеж, основан на експорт, ще доведе до продължаване на тенденцията към намаляване на външнотърговския дефицит и подобряване на състоянието на платежния баланс на страната. През 2009 г. дефицитът по текущата сметка остана голям в сравнение с други нови държави-членки, но очакванията са той да продължи да намалява. Кризата осигурява благоприятни възможности в средносрочен план България да преодолее външния дисбаланс, но това зависи от способността на икономиката да преориентира ресурси към търгуемия сектор, да повиши производителността на труда и ценовата и неценовата конкуренция.

Данните на БНБ за първото шестмесечие на 2010 г. показват малък дефицит по текущата и капиталовата сметка (1.9% от БВП), който значително е намалял спрямо същия период на 2009 г. (6.9% от БВП). Слабото местно търсене и нарастващото външно търсене се отразяват благоприятно върху търговското салдо, което за първата половина на 2010 г. е отрицателно в размер на 1398.5 млн. евро (4% от БВП) при отрицателно салдо от 2393.4 млн. евро (7.1% от БВП) за януари – юни 2009 г. Износът за януари – юни 2010 г. спрямо същия период на предходната година бележи прираст от 25.6% на годишна база при спад на годишна база от 30.1% за януари – юни 2009 г. Вносът за първата половина на 2010 г. нараства с 5% на годишна база спрямо януари – юни 2009 г. при спад на годишна база от 34.9% за януари – юни 2009 г. По данни на БНБ за периода януари – април 2010 г. ПЧИ намаляват на база същия период за 2009 г., а НСИ отчита, че през второто тримесечие на текущата година ПЧИ нарастват спрямо първото. През третото и четвъртото тримесечие на 2010 г. очакванията са за положителен нетен приток на ПЧИ, който обаче ще бъде по-нисък в сравнение със съответния период на 2009 г. В резултат на това съотношението на ПЧИ към БВП на годишна база ще се понижава, което ще окаже негативно влияние върху процеса на излизане на икономиката от кризата. Привличането на повече чуждестранни инвестиции в страната през следващите месеци и години зависи изключително от подобряване на бизнес климата, добрата

държавна бюджетна позиция, административната и съдебната реформа и не на последно място от скоростта и темповете на възстановяване на останалите държави от ЕС.

### *Заключение*

Подготовката на България за приемане на еврото се осъществява в изключително динамична, сложна и несигурна вътрешна и външна среда, върху която силно влияние оказват ефектите от световната икономическа криза, която рефлектира върху поведението и позициите на националните и европейските институции и икономическите агенти. Присъединяването към еврозоната е продължителен и сложен процес, обусловен от взаимосвързани икономически и политически фактори както в държавите-кандидатки, така и в тези от паричния съюз. За разлика от Словения, Словакия, Малта и Кипър България е изправена пред допълнителни изпитания и рискове в процеса на подготовка за пълноправно членство в ИПС, защото страните изпълняват по-лесно критериите за еврозоната в добри и спокойни времена, отколкото по време на криза.

Понастоящем Естония е единствената държава – членка на ЕС, която ще се присъедини към еврозоната след запазването на паричния съвет и фиксирания курс през целия период на подготовка за влизане в нея. Опитът на Естония доказва, че номиналната конвергенция е постижима и от държави с режим на паричен съвет, което дава основания да се счита, че България ще успее, но за това са нужни преди всичко структурни реформи, нова визия за развитие на икономиката и стриктна фискална политика.

Световната икономическа криза представлява сериозен тест за устойчивостта на икономиките към външни шокове, както и за степента на тяхната конвергенция. Негативното влияние на кризата върху икономиката на България усложнява процеса на подготовка и ще забави изпълнението на критериите за влизане в еврозоната. Възстановяването на икономиката ще бъде продължително, а високият темп на растеж от периода преди рецесията ще бъде трудно постижим, което като цяло ще създава както възможности, така и трудности за номиналната и реалната конвергенция.

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# ИЗПОЛЗВАНИ СЪКРАЩЕНИЯ

| | |
|---|---|
| БВП | брутен вътрешен продукт |
| ВМ II | Валутен механизъм II |
| ДФЕС | Договор за функционирането на Европейския съюз |
| ЕБВР | Европейска банка за възстановяване и развитие |
| ЕИФС | Европейски инструмент за финансова стабилност |
| ЕК | Европейска комисия |
| ЕС | Европейски съюз |
| ЕСЦБ | Европейска система на централните банки |
| ЕЦБ | Европейска централна банка |
| ИПС | Икономически и паричен съюз |
| ИФК | Икономически и финансов комитет |
| МВФ | Международен валутен фонд |
| НСИ | Национален статистически институт |
| НЦБ | национални централни банки |
| ПЧИ | преки чуждестранни инвестиции |
| ПС | паричен съвет |
| ПСР | Пакт за стабилност и растеж |
| ХИПЦ | хармонизиран индекс на потребителските цени |
| ЦИЕ | държави от Централна и Източна Европа (Словения, Словакия, Полша, Чехия, Унгария, Румъния, България, Литва, Латвия и Естония) |

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# Trade, Convergence and Exchange Rate Regime: Evidence from Bulgaria and Romania

Emilia Penkova-Pearson

**Abstract.** The aim of the paper is to reveal the similarities and differences of export and import demand functions of Bulgaria and Romania over the period 2000–2008 using quarterly data. On the one hand, the countries are similar in respect to the convergence process with the euro area that they are undergoing, on the other hand, they have different exchange rate regimes: Bulgaria has a currency board arrangement, Romania's exchange rate regime is characterized by a managed float. The empirical analysis will therefore contribute to the debate if the countries with flexible exchange rates are in a more advantageous position concerning competitiveness compared to the countries with fixed exchange rates. The study shows that the export dynamics of Bulgaria and Romania over the period of investigation is largely explained by the EU growth, while the increasing market shares of the two countries are partly due to strong FDI inflows. A key conclusion of the paper is that the real exchange rate appreciation, which was more prominent in Romania than in Bulgaria, did not have significant impact on export developments of neither of the two countries. This is mainly due to the fact that the real exchange rate appreciation during this period of convergence is likely to reflect an upward movement in its equilibrium value, not a loss in competitiveness. Another important conclusion is that the convergence process in respect to trade in both economies is similar irrespective of their exchange rate regime, currency board or managed float.

**Резюме.** Целта на статията е да разкрие сходствата и различията във функциите на търсенето на износа и вноса на България и Румъния в периода 2000–2008 г., като се използват тримесечни данни. От една страна, по отношение на процеса на конвергенция с еврозоната, който протича в тях, държавите си приличат, а от друга страна, те са с различни режими на валутен курс – България е с паричен съвет, а Румъния е с управлявано плаващ валутен курс. Поради това, ако страните с гъвкави валутни курсове са в по-добра позиция по отношение на конкурентоспособността си от тези, които са с фиксиран валутен курс, то емпиричният анализ ще има принос за дискусията. Изследването показва, че динамиката на износа на България и Румъния през разглеждания период се обяснява преди всичко с растежа в ЕС, докато нарастването на пазарните дялове на двете страни отчасти се дължи на значителните потоци от преки чуждестранни инвестиции. Главният извод в изследването е, че повишаването на реалния валутен курс, което беше по-ясно изразено в Румъния, отколкото в България, няма съществено отражение върху динамиката на износа в нито една от двете страни. Това се дължи главно на факта, че през този период на конвергенция поскъпването на реалния валутен курс изглежда отразява възходящо движение на равновесната му стойност, а не загуба на конкурентоспособност. Друг важен извод е, че процесът на конвергенция по отношение на търговията в двете икономики е сходен, независимо от техните режими на валутен курс– паричен съвет или управлявано плаващ курс.

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## Contents

## I. Introduction

Bulgaria and Romania are small open economies operating in the highly integrated Single Market of the EU. They registered strong export, import and GDP growth over the analyzed period (2000–2008). This period is characterized by nominal and real convergence, illustrated by catching-up developments in both countries' productivity, income and price levels towards the prevailing EU average levels[1], and by process of deepening trade and financial integration. In 2007 the accession to the EU intensified the restructuring of the two economies. Furthermore, the anticipation of high growth and the relatively high risk-adjusted expected returns before and after the accession accelerated the foreign capital inflows. The catching-up process was also accompanied by a trend of real exchange rate appreciation of the two countries' currencies which is likely to affect their competitiveness.

The aim of the paper is to investigate empirically export and import demand functions of Bulgaria and Romania over the period 2000–2008 using quarterly data. This is a first empirical analysis on trade of Bulgaria and Romania which provides the contributions of the main determinants of exports and imports of the two countries. Following Allard (2009)[2] rather than just providing the elasticities, this method combines the elasticities with the evolution of the explanatory variables to quantify their impact during the period of investigation. Furthermore, Bulgaria has a currency board arrangement, Romania's exchange rate regime is characterized by a managed float. The empirical analysis will therefore provide some insights not only in the context of the convergence process of the two countries with the euro area but also in relation to the exchange rate regime[3], and will contribute to the debate if the countries with flexible exchange rates are in a more advantageous position concerning competitiveness compared to the countries with fixed exchange rates.

The rest of the paper is organized as follows: Section II summarizes the initial conditions in Bulgaria and Romania and the evolution of trade during transition to a market economy. Section III provides different views on the effect of the exchange rate regime on trade. Section IV outlines the stylized facts of the analyzed period. Section V presents the theoretical framework of the empirical models. Section VI describes the data. Section VII summarizes the empirical estimation and results. Section VIII concludes the paper.

[1]The convergence is one of the most used concepts which originates in the Solow neoclassical theory of economic growth, the convergence being defined as the pattern that a country follows towards the stability state.

[2]Allard (2009) analyzes the developments in the external sector in Poland, the Czech Republic, Hungary and Slovakia over the period 2002–2007.

[3]The analysis does not aim to cover all possible differences and similarities in the external sector of the two countries and thus may need to be complemented with country specific analyses.

## II. Initial conditions and the evolution of foreign trade during transition

Foreign trade liberalization is one of the most dynamic areas of economic transformation among other reforms undertaken by transition countries. After the collapse of communism, in a relatively short period of time, Bulgaria and Romania abandoned the inward-oriented trade within the Council for Mutual Economic Assistance (CMEA) for an open system of commercial exchange, with the EU becoming one of the most important trade partners.

The last decade before transition to a market economy, the socialist economies were as export-oriented as other developing countries (Krugman and Obstfeld, 1977), with the two groups following a similar path. The collapse of the communist regimes in the late 80's induced a dramatic fall in exports – mainly due to the abandonment of the CMEA agreement. However, foreign exchange liberalization allowed for a quick re-orientation and an increase of trade volume in the case of transition countries because their degree of openness and diversification was close to the level existing in the EU (Havrylyshyn and Al-Atrash, 1998).

As emphasized by Brenton (1999) the evolution of foreign trade for countries in transition is characterized by two main tendencies: a reorientation of exchange towards EU countries and an increase in trade deficits. A trade deficit does not necessarily mean that a country's position deteriorates in terms of foreign trade as long as the inflow of capital is significant. The trade balance deficit in Bulgaria and Romania during the period of investigation should be therefore considered within the overall context of the balance of payments. Hence, foreign trade is more complex and more important than the simple exchange of commodities between a transition country and the rest of the world. Foreign direct investment is a crucial component affecting foreign trade and should be taken into account when analyzing trade performance.

## III. Exchange rate regime and trade

The choice of an exchange rate regime and its macroeconomic implications – a well debated subject since the collapse of the Bretton-Woods system in the early 1970s gained renewed interest of researchers and policy makers with the series of the Asian financial crises in the late 1990s[4]. Most of the research focused on the effect of exchange rate regimes on economic

[4]Indonesia, South Korea and Thailand were the countries most affected by the crisis.

growth and inflation, but the seminal work of Rose (2000), which investigates the effect of monetary union on bilateral trade, has generated considerable interest in investigating the influence of exchange rate regimes on international trade (Klein and Shambaugh, 2006; and Adam and Cobham, 2007). These studies almost unanimously find that exchange rate regimes with lower uncertainty and transaction costs – namely, conventional pegs and currency unions are significantly more pro-trade than flexible regimes.

In Bulgaria in mid-1997 a currency board arrangement was introduced by fixing the national currency to the Deutsche mark (and since 1 January 1999 – to the euro). The sustainability of the currency board arrangement is guaranteed by its design (law).The main characteristics are as follows: full coverage of the Bulgarian National Bank's monetary liabilities with liquid foreign exchange reserves; lending to the Government and banks forbidden by law; interest rates are market-based[5].

Romania's exchange rate regime is characterized by a managed float against the euro. Starting from June 2004 the National Bank of Romania adopted several flexibility measures of the exchange rate through decreasing the dimension and frequency of interventions in the currency market. From November 2004 the central bank increased the exchange rate flexibility measure undertaken for the transition to a crawling band. The National Bank of Romania introduced the inflation targeting regime in 2005. However, the monetary policy is not of a pure inflation targeting as the exchange rate regime is still a managed float.

The role of the exchange rate regime for the competitiveness of a given country and its economic development is subject to theoretical and empirical debates. One of the standard understandings of this issue is that the nominal depreciation of the currency of a country with a floating exchange rate supports its competitiveness in the short-term by making its exports cheaper. The floating exchange rate also provides an opportunity for implementing an autonomous counter-cyclical monetary policy. In practice, however, there are transmission channels, which can cushion or fully neutralise the short-term positive effects of the currency depreciation and the possibilities for implementation of autonomous monetary policy. Among the factors which neutralise the positive effects of the currency depreciation are making imports more expensive, the increase in inflation, salaries and inflation expectations, the effect on the balances of companies and banks. These factors are more strongly expressed with small and open economies like Bulgaria, for which the opportunities for implementing autonomous monetary policies

[5]For details, see Appendix I: Currency board arrangement in Bulgaria.

are limited. In the medium term, the depreciation of the local currency does not lead to a sustainable improvement of the competitive position of the country.

In practice, the channels that can mitigate the positive effects of currency depreciation on exports are as follows: First, the depreciation of the national currency results in appreciation of the import component of production (imports of raw materials and investment goods) thus leading to higher expenditure of companies and deteriorating exports' competitive positions. Second, the higher import price increases the inflation rate. This higher inflation in turn exerts pressure towards nominal wage rises further pushing up expenditure of companies. Third, local currency depreciation also has a direct negative effect on the financial performance of companies since the service of liabilities in foreign currency becomes more costly (a balance sheet effect).

The paper will therefore contribute to the debate if the countries with flexible exchange rates are in a more advantageous position concerning competitiveness compared to the countries with fixed exchange rates.

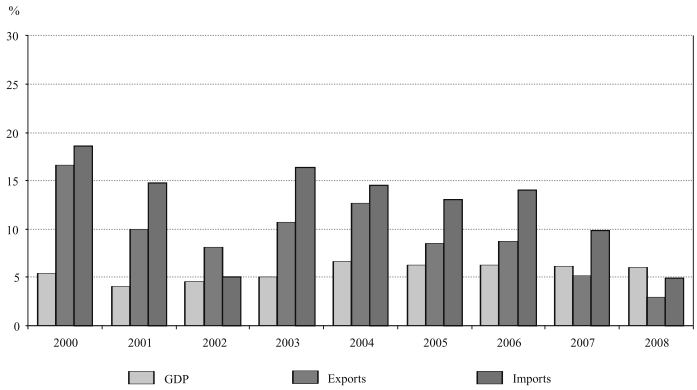
## IV. Stylized facts of the analyzed period (2000–2008)

The analyzed period is characterized by catching-up developments of Bulgaria and Romania in their productivity, income and price levels towards the prevailing EU average levels as well as by a process of a deepening trade and financial integration within the Single Market of EU. The catching-up process is likely to be a long-term one as the initial productivity and price level gap is substantial. In view of the long-term horizon of this process and the high degree of openness and integration of the Bulgarian and Romanian economy with the EU, the importance of maintaining and strengthening competitive advantages in the medium and long run cannot be overestimated. Higher stage of economic development (*i.e.* convergence), on the other hand, implies a more competitive economy, as the companies are expected to rely more heavily on quality improvement and innovation strategies, abandoning low-cost competitive advantages. Over the 2000–2008 period all transition economies in Eastern and South-Eastern countries experienced real and nominal convergence. The main factors behind this favorable trend are the EU membership, the increased integration within the Single Market of the EU and the improved macroeconomic stability. Bulgaria and Romania were also successful in achieving higher level of economic convergence during the analyzed period.

Since 2000 till the third quarter of 2008 when the global economic and financial crisis affected the two economies, GDP, export and import growth were strong (see Graph 4.1).

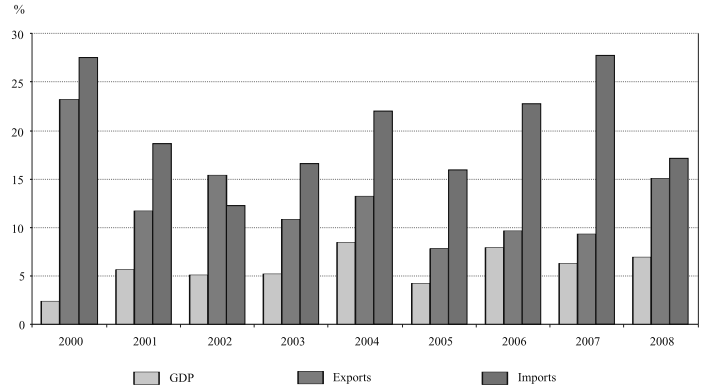
Graph 4.1

**REAL GROWTH RATES OF BULGARIAN GDP, EXPORTS AND IMPORTS**




**Source:** Bulgarian National Bank.

**REAL GROWTH RATES OF ROMANIAN GDP, EXPORTS AND IMPORTS**

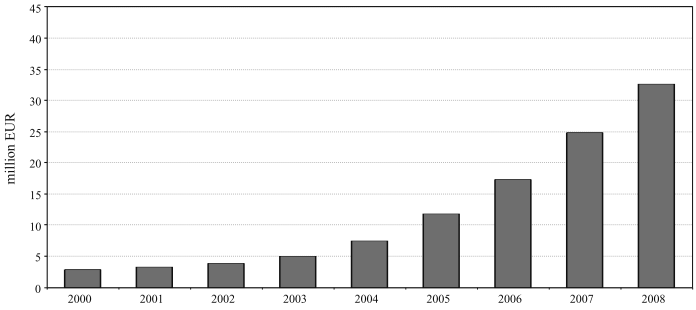



**Source:** Eurostat and Romanian Central Bank.

Bulgaria and Romania witnessed large FDI inflows prior to and after the EU accession (see Graph 4.2). In 2007 (the accession year) FDI as per cent of GDP in Bulgaria was 29 per cent, and in Romania it was 6 per cent. As of 2008 FDI accumulated inflows in Bulgaria amounted to around 33 million euro and in Romania were around 41 million euro.

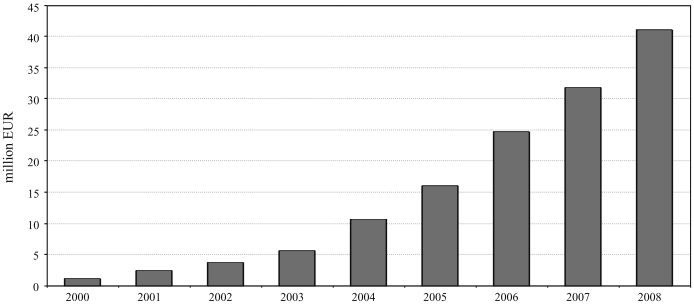
Graph 4.2

**FDI STOCK IN BULGARIA**




**Source:** BNB.

**FDI STOCK IN ROMANIA**



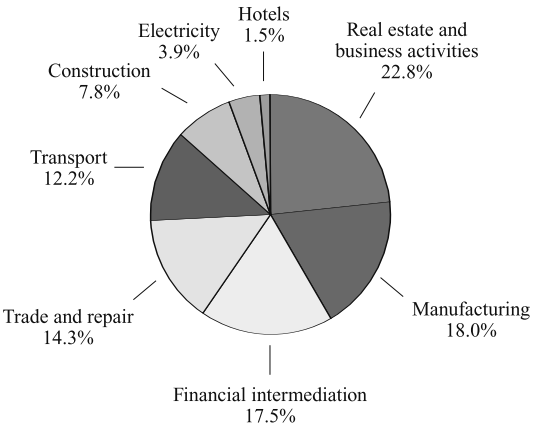

**Source:** Romanian Central Bank.

In Bulgaria, accumulated FDI were mainly in real estate (22.8 per cent), manufacturing (18 per cent) and financial intermediation (17.5), illustrating that part of it was in export-oriented sectors (see Graph 4.3). In Romania, a large share went to manufacturing (31.3 per cent), financial intermediation (20.5 per cent) and construction and real estate (12.6 per cent)[6] (see Graph 4.3).

[6]As a large share of FDI went to real estate, we subtract it from the total FDI in the empirical estimation for Bulgaria and Romania.

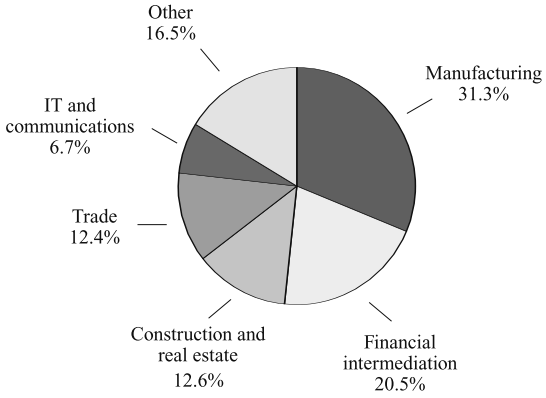
Graph 4.3

**FDI STOCK IN BULGARIA IN 2008**




**Source:** BNB.

**FDI STOCK IN ROMANIA IN 2008**

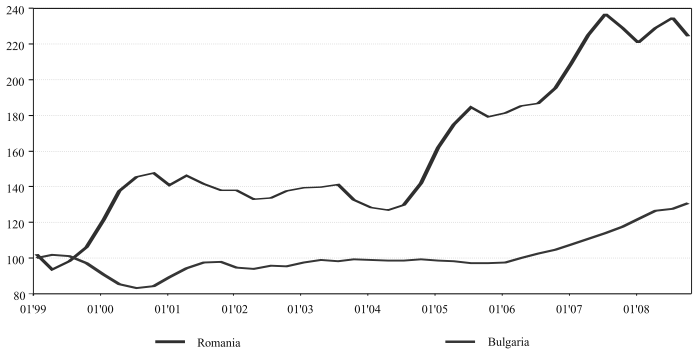



**Source:** Romanian Central Bank.

The catching-up process was also characterized by a trend of real exchange rate appreciation in both countries (see Graph 4.4). The appreciation is mainly driven by fundamentals and the successful economic convergence achieved by these countries both in nominal and in real terms.

Graph 4.4

**REAL EFFECTIVE EXCHANGE RATE, BASED ON ULC, 1999=100**




**Source:** European Commission, Price and Cost Competitiveness, May 2009.

**Note:** The REER index for each of the countries is calculated relative to a basket of 36 industrial countries.

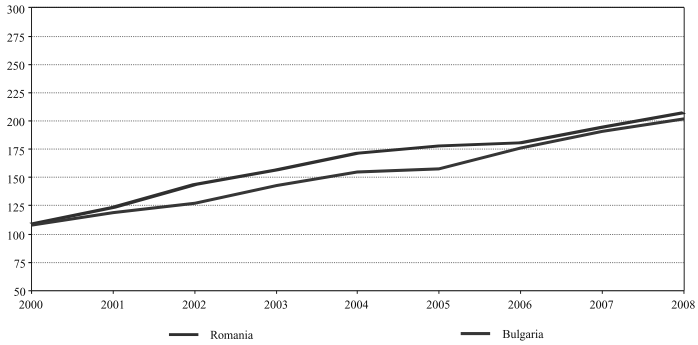
The degree of the real exchange rate appreciation in the run-up to the financial turmoil was higher in Romania than in Bulgaria despite the fact that the latter is with a fixed exchange rate in the currency board regime. The factors which explain the difference in the appreciation of the real exchange rate in both countries are subject to a different piece of research which will complement this paper. However, empirical research on Bulgaria shows that the observed appreciation over the analyzed period is due to fundamentals such as labour productivity, FDI, terms of trade and savings. Econometric estimation of these determinants show that they have the expected signs: an increase in labour productivity and FDI leads to an appreciation of the real exchange rate, positive terms of trade and lower savings also cause an appreciation. Furthermore, the empirical evidence supports the view that during the analyzed period labour productivity growth was the main determinant of the real effective exchange rate dynamics and it had the highest contribution to its annual average appreciation.

In the medium run, the real effective exchange rate is expected to continue to appreciate in both countries due to fundamentals (with the main contribution of labour productivity) and the successful economic convergence of the countries. The rate of an appreciation will depend on the speed of the convergence process.

Over the period of investigation there was a sustainable increase in the share of Bulgarian and Romanian exports in world exports (see Graph 4.5). The main exporting partner of the two countries is the EU. Furthermore, the important role played by the EU as a main trading partner is evident by the significant increase of the share of Bulgarian and Romanian exports in the EU27 imports, by 98 per cent in 2008 for Bulgaria and by 90 per cent for Romania.

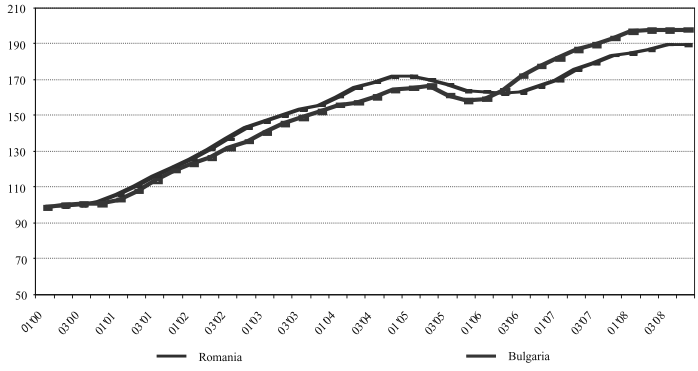
Graph 4.5

**SHARE OF EXPORTS OF GOODS IN WORLD EXPORTS (ANNUALIZED INDEX, 1999=100)**




**Source:** European Commission, AMECO database, last update: 22 April 2009.

**EXPORT SHARES OF NEW EU MEMBER COUNTRIES IN EU27 IMPORTS (ANNUALIZED INDEX, 2000=100)**

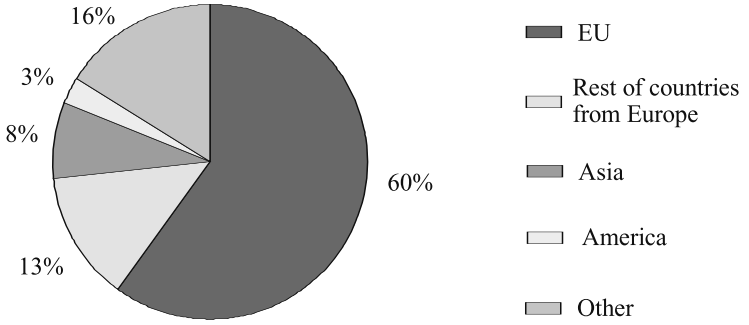



**Source:** Eurostat, BNB.

The two countries are also characterized by geographical diversification of their exports (see Graph 4.6).

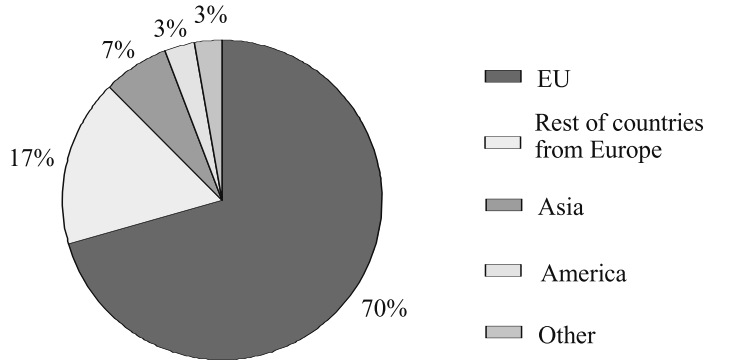
Graph 4.6

**GEOGRAPHICAL DISTRIBUTION OF BULGARIAN EXPORTS IN 2008**




**Source:** Bulgarian National Bank.

**GEOGRAPHICAL DISTRIBUTION OF ROMANIAN EXPORTS IN 2008**



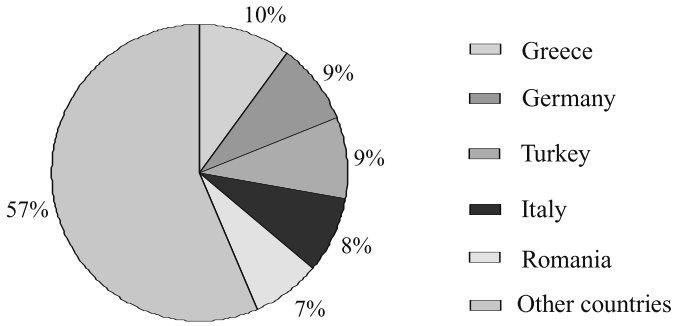

**Source:** Romanian Central Bank.

As of 2008 the main exporting partners of Romanian exports are Germany (16.4 per cent), Italy (15.5 per cent), France (7.4 per cent) and Turkey (6.5 per cent) (see Graph 4.7). As for Bulgaria, these are Greece (9.9 per cent), Germany (9.1 per cent), Turkey (8.8 per cent) and Italy (8.4 per cent) (see Graph 4.7), illustrating that during the analyzed period there is an improve-

ment in the quality of exports in both countries as their exports are oriented towards developed countries which create entry opportunities for transition economies to progress on the quality ladder.

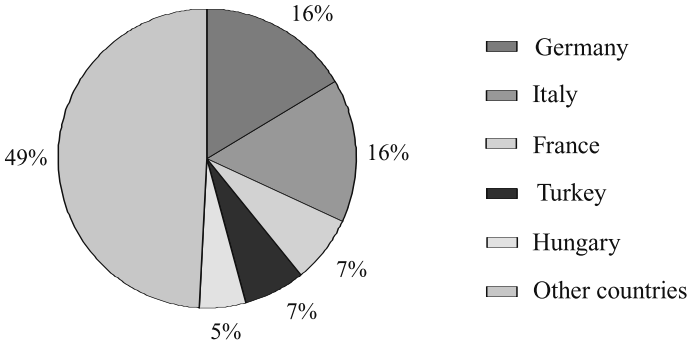
Graph 4.7

**THE MAIN PARTNER COUNTRIES OF BULGARIAN EXPORTS IN 2008**




**Source:** Bulgarian National Bank.

**THE MAIN PARTNER COUNTRIES OF ROMANIAN EXPORTS IN 2008**

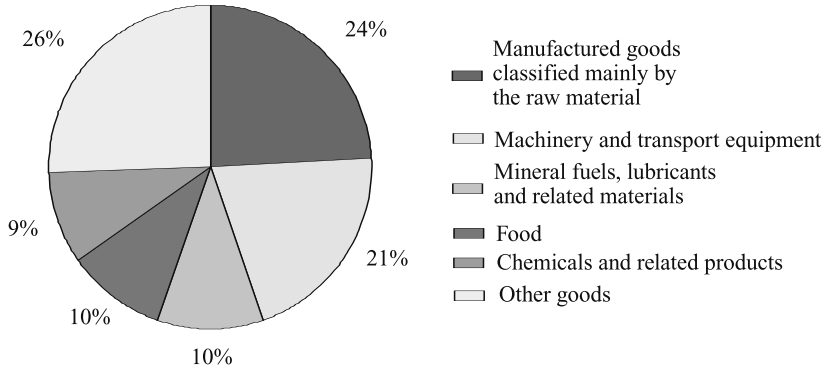



**Source:** Romanian Central Bank.

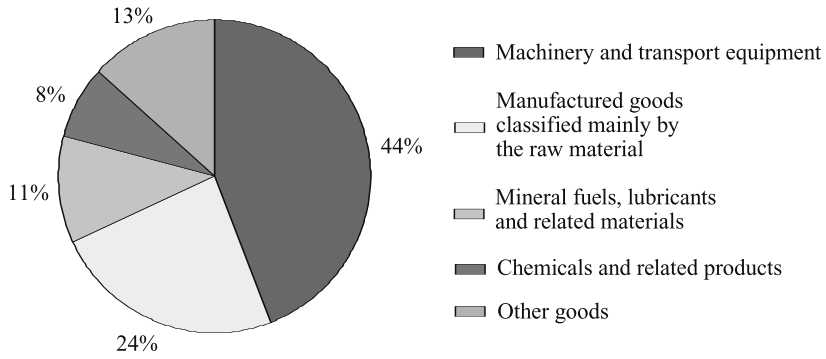
Product diversification is another important feature of Romanian and Bulgarian exports (see Graph 4.8).

Graph 4.8

**BULGARIAN EXPORTS BY MAIN SECTIONS ACCORDING TO SITC IN 2008**




**ROMANIAN EXPORTS BY MAIN SECTIONS ACCORDING TO SITC IN 2008**




The highest share of exports for both Romania and Bulgaria is occupied by machinery and manufactured goods which provides further support to the hypothesis that there is an improvement in the quality of export goods during the analyzed period. Although the share of machinery is higher in Romanian exports than in the Bulgarian, the transition towards more technology intensive production in Bulgaria is evident and illustrated by the developments in the two sectors – textile and clothing, on the one hand, and electrical equipment, electronics, transport equipment and other machinery,

on the other (data are from short-term indicators of the National Statistical Institute). Textile industry decreased its share in total manufacturing exports at constant prices from 15 per cent in 2004 to 11 per cent in 2008. Exports of electrical equipment, electronics, transport equipment and other machinery grew from 16 per cent in 2004 to 22 per cent in 2008 and increased its exports between 2005 and 2008 by 85 per cent in real terms.

## V. Theoretical framework

There are several different methods of modeling demand for exports and imports. The appropriate model depends on different factors: whether the purpose of the model is hypothesis-testing or forecasting; data availability and the level of disaggregation; and the type of traded goods. However, there are two general models of trade – perfect and imperfect – substitutes models. If the trade studies deal with aggregate imports (exports), the two models could be viewed as competitors. If, however, disaggregation is permitted, the two models could be viewed as complements – one dealing with trade for differentiated goods, and the other with trade for close – if not – perfect substitutes.

### *The perfect–substitutes model*

The following equations (5.1)–(5.8) below constitute a simple perfect substitutes model of trade for a representative country (i), outlined by Goldstein and Khan (1985):

$$Di = l(P_i, Y_i) \qquad l_1<0,\ l_2>0 \qquad (5.1)$$

$$S_i = n(P_i, F_i) \qquad n_1 > 0,\ n_2 <0 \qquad (5.2)$$

$$I_i = D_i - S_i \qquad (5.3)$$

$$X_i = S_i - D_i \qquad (5.4)$$

$$PI_i = P_i = PX_i = eP_w \qquad (5.5)$$

$$D_w = \sum_{i=1}^{m} D_i \qquad (5.6)$$

$$S_w = \sum_{i=1}^{m} S_i \qquad (5.7)$$

$$D_w = S_w \qquad (5.8)$$

In this perfect-substitutes model, $D_i$ is the total quantity of traded goods demanded in country *i*; $S_i$ is the supply of traded goods produced in country *i*; $I_i$ and $X_i$ are the quantities of country *i's* imports and exports; $PI_i$, $PX_i$, $P_i$ and $P_w$ are the import, export, domestic and world prices of traded goods; $D_w$ and $S_w$ are the world demand and supply of traded goods; and $Y_i$ and $F_i$ are money income and factor costs in country *i*.

There are two main features of the perfect–substitutes model. First, there are no separate import and export demand functions. Instead, the demand for imports and the supply of exports represent the "excess" demand and "excess" supply respectively for domestic goods; see *eqs*. (5.3) and (5.4). Second, when we abstract from transportation costs and other trade barriers (*e.g.* tariffs) and express all prices in a common currency, then there is only one traded goods price in the perfect-substitutes model (*i.e.* $P_i = PI_i = PX_i = P_w$). Furthermore, this (world) price is determined by the interaction of world supply and world demand for the traded good. The perfect-substitutes model is therefore more appropriate for modeling trade relationships of homogenous commodities (wheat, copper, sugar, *etc*.) that are traded on international commodity markets at a common price.

### *The imperfect–substitutes model*

In equations (5.9–5.8) an imperfect substitutes model of country i's imports from, and exports to, the rest of the world (*) outlined by Goldstein and Khan (1985) is presented:

$$I_i^d = f(Y_i, PI_i, P_i) \qquad f_1, f_3 > 0,\ f_2 < 0 \qquad (5.9)$$

$$X_i^d = g(Y^*e, PX_i, P^*e) \qquad g_1, g_3 > 0,\ g_2 < 0 \qquad (5.10)$$

$$I_i^s = h[PI^*(1+S^*), P^*] \qquad h_1 > 0,\ h_2 < 0 \qquad (5.11)$$

$$X_i^s = j[PX_i(1+S_i), P_i] \qquad j_1 > 0,\ j_2 < 0 \qquad (5.12)$$

$$PI_i = PX^*(1+T_i)e \qquad (5.13)$$

$$PI^* = PX_i(1+T^*)/e \qquad (5.14)$$

$$I_i^d = I_i^s e \qquad (5.15)$$

$$X_i^d = X_i^s \qquad (5.16)$$

These eight equations determine the quantity of imports demanded in country *i* ($I_i^d$), the quantity of country *i*'s exports demanded by the rest of the world ($X_i^d$), the quantity of imports supplied to country *i* from the rest of the world ($I_i^s$), the quantity of exports supplied from country *i* to the rest of the world ($X_i^s$), the domestic currency prices paid by importers in the two regions ($PI_i$ and $PI^*$), and the domestic currency prices received by exporters in two

regions ($PX_i$, $PX^*$). The exogenous variables are the levels of nominal income in the two regions ($Y_i$, $Y^*$), the price of (all) domestically produced goods in the two regions ($P_i$, $P^*$), the proportional tariff ($T_i$, $T^*$) and subsidy rates ($S_i$, $S^*$) applied to exports and imports in the two regions, and the exchange rate ($e$) linking the two currencies (expressed in units of country *i's* currency *per* unit of the rest-of-world's currency).

The main characteristic of the model is that the consumer is postulated to maximize utility subject to a budget constraint. The demand functions for imports and exports therefore represent the quantity demanded as a function of the level of (money) income in the importing region, the imported *good's* own price, and the price of domestic substitutes. Often, an additional assumption is made that the consumer has no money illusion, so that a doubling of money income and all prices leaves demand constant, *i.e.* $f_1 + f_2 + f_3=0$, $g_1 + g_2 + g_3=0$. Such homogeneity of the demand function is expressed by dividing the right-hand side of *eq*. (5.9) by $P_i$, so that the two arguments of the demand function become the level of real income ($Y_i/P_i$) and the relative price of imports ($PI_i/P_i$). Accordingly, if we divide the right-hand side of eq. (5.10) by $P^*$ the two arguments of the demand function for exports become the level of external demand ($Y^*/P^*$) and the relative price of exports ($PX_i/P^*$). These are the two equations that are usually estimated in empirical work modeling export and import of a given country. The prevailing practice is therefore to assume that the supply-price elasticties for imports and exports (*i.e.* $h_1$ in *eq*. (5.11) and $j_1$ in eq. (5.12) respectively) for small economies are infinite which permits satisfactory estimation of the import and export demand equations (5.9) and (5.10) by single-equation methods, since $PI_i$ and $PX_i$ can be viewed as exogenous.

## *The import and export demand functions for Bulgaria and Romania*

The imperfect–substitutes model is more appropriate for the purpose of this paper due to the fact that neither exports nor imports are perfect substitutes for domestic goods. If domestic and foreign goods were perfect substitutes, then countries would specialize, either only importing or only exporting each particular good. In practice, however, both domestic and imported goods can be found coexisting on markets, indicating that countries do not in fact specialize to such a high degree.

### *Import demand functions*

Studies by Khan and Ross (1977) and Salas (1982) suggest that in modelling an aggregate import demand function, the log-linear specification is

preferred to the linear formulation. The use of the log-linear formulation constrains the price and income elasticity estimates to be constant over the estimation period while the linear form of the import demand equation implies a decreasing price elasticity and an income elasticity tending towards one.

Accordingly, following the imperfect-substitutes model, the long run import demand function for Bulgaria and Romania is specified as follows:

$$\ln(M^{d}) = m_0 + m_1 \ln(DD) + m_2 \ln(\frac{IMP}{GDP}), \qquad m_1>0,\ m_2<0 \qquad (5.17)$$

where DD is domestic demand, IMP is the import deflator, GDP is the GDP deflator.

Therefore, the demand for imports depends positively on domestic demand and negatively on the real exchange rate which is the relative price of import and GDP deflators.

### *Export demand functions*

Following the imperfect-substitutes model the following export demand function for Bulgaria and Romania can be derived:

$$X^{d} = x(Y^{f}, PX_{h}, PX_{c}) \qquad f_1>0,\ f_2<0,\ f_3>0 \qquad (5.18)$$

where $X^d$= the quantity of the domestic good which is exported to the foreign market, $Y^f$= the real foreign income, $PX_h$=the price of the domestic good, $PX_c$= the price of competing suppliers in the foreign market in a common currency, and $f_i$=the expected partial derivatives of the export function with respect to the $i^{th}$ argument .

In the paper, we also incorporate FDI in the export demand function to investigate if it has a significant effect on export performance. Foreign direct investment influence supply-side determinants of exports, reflecting to some extent the quality of physical capital as well as worker skills and market penetration potential. The so called New Trade Theory, influenced by the theory of industrial organization has added this new insight into the possible factors affecting the demand for exports, such as FDI or the quality of traded goods. There are several papers that find a positive relationship between FDI and exports. Using aggregate data Driver and Wren-Lewis (1999) derive a specification for exports that allows for traditional relative-price effects as well as effects from innovation in variety and quality. They estimate this model for the panel of the G-7 countries using time series and panel co-integration techniques. In addition, Pain and Wakelin (1998) analyze the export perfor-

mance and also relate foreign direct investment to innovation in industries. They estimate conventional panel of 11 OECD countries specified as an error correction mechanism. Finally, Bajo and Montero (1995, 2001) estimate Spanish demand for exports using FDI and examine the causality relationship between FDI and trade. Based on the above-mentioned arguments, equation (3.2) can be extended with the introduction of FDI stock as a proxy for quality:

$$X^d = x(Y^f, PX_h, PX_c, FDI), \qquad f_4>0 \qquad (5.19)$$

The log-linearization of the equation (5.19) is:

$$\ln(X^d) = x_0 + x_1 \ln(Y^f) + x_2 \ln(\frac{PX_h}{PX_c}) + x_3 \ln(FDI), \; x_1>0, \; x_2<0, \; x_3>0 \quad (5.20)$$

The above equation represents the long-run co-integrating relationship among exports and their determinants, illustrating that real exports depend positively on external demand, negatively on real exchange rate which is the ratio of home to competitor's price, and positively on FDI stock which is a proxy for quality.

## VI. Data

All the data are in real terms (2005=100 for Bulgaria and Romania). The data on real exports, real imports and domestic demand for Bulgaria are from the Bulgarian National Accounts of the Bulgarian National Statistical Institute. The data on real exports, real imports and domestic demand for Romania are taken from the Romanian Central Bank. The import, export, GDP and investment deflators for Bulgaria are taken from the Bulgarian National Statistical Institute. The import, export, GDP and investment deflators for Romania are from the Romanian Central Bank. The FDI accumulated inflows for Bulgaria are from the Bulgarian National Bank, they are in national currency and investment in real estate is subtracted. The FDI accumulated inflows for Romania are from the Romanian Central Bank, they are also in national currency and investment in real estate is subtracted. Manufacturing export price for advanced economies from the IMF is used as a proxy for external price for Bulgaria and Romania. However, it is in US dollars, so we convert it in national currencies by using the exchange rate of Bulgarian lev *per* US dollar from the Bulgarian National Bank, and the exchange rate of the Romanian leu *per* US dollar from Eurostat. The external demand of Bulgarian and Romanian exports is based on calculations of the OECD and the Bulgarian National Bank.

## VII. Empirical estimation and results

The empirical estimation includes four stages and employs the Engle-Granger (1987) two step procedure.

The four stages of the overall empirical estimation of the export and import demand functions of Bulgaria and Romania are as follows:

First, we determine the order of integration of the variables by employing Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The PP test was designed to be robust for the presence of autocorrelation and heteroscedasticity.

The regression equation for the ADF test (see Dickey and Fuller, 1979) is given as follows:

$$\Delta Y_t = a + bt + cY_{t-1} + \sum_{i=1}^{k} d_i \Delta Y_{t-i} + e_t \qquad (4.1)$$

where $\Delta$ is first difference operator, t refers to time trend, and k are additional terms in the first differences for the Augmented Dickey-Fuller (ADF) test $e_t$ is the regression error assumed to be stationary with zero mean and constant variance. The Phillips Perron test is also based on equation (4.1) but without the lagged differences. Both tests were carried out to reject the null hypothesis of a unit root (c=0 for ADF, and c=1 for PP). The results are presented in Appendix I, and they show that all variables are integrated of order one, I(1), *i.e.* stationary in their first differences.

Second, we estimate the long-run equation which is the first step of the Engle-Granger two step procedure.

Third, as we find that the variables are co-integrated (the error term is stationary, the results are in Appendix II), we specify error correction models and estimate them – this is the second step of the Engle-Granger two step procedure. In the short run, we include four lags, and non-significant lags are eliminated sequentially starting with the least significant one until only significant variables are left.

In a final step following Allard (2009), dynamic contributions are computed to assess the role of the various explanatory variables in the evolution of exports and imports over the 2000–2008 period.

The results from the estimated equations are enclosed in Appendix III. The estimated coefficients take the theoretically expected sign except for the short-run relative price for Romanian exports. In most cases, the coefficients are significant at 5 or 10 per cent level.

Table 7.1

**EXPORTS LONG-TERM ELASTICITIES RELATED TO NON-PRICE COMPETITIVENESS**

| | Bulgaria | Romania |
|---|---|---|
| External demand | 0.96 | 0.78 |
| FDI accumulated inflows | 0.20 | 0.19 |

Table 7.2

**EXPORTS LONG-TERM ELASTICITIES TO PRICE COMPETITIVENESS**

| | Bulgaria | Romania |
|---|---|---|
| Relative price | -0.08 | -0.10 |

The pick up in external demand accounts for the largest part of growth of exports for Bulgaria and Romania over 2000–2008 (see Graph 7.1). This growth reflects the ability of the smaller countries to expand their market share more systematically since transition, a result evident from the relatively high elasticities to external demand (the elasticity is higher in Bulgaria than in Romania).

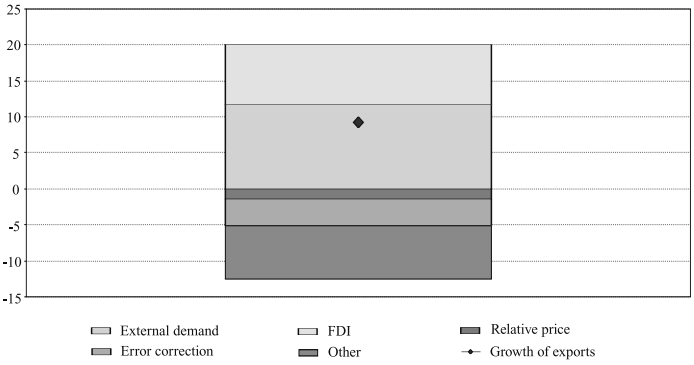
The accumulated FDI investment also contributed positively to export growth, more in Bulgaria than in Romania. This illustrates that the quality of physical capital and worker skills played a significant role for the export performance of the two economies. The EU accession also contributed to attract new investors leading to more export-oriented new projects.

The price elasticity is low in both economies, however, it is slightly less in Bulgaria than in Romania possibly reflecting a different technology content of export goods (for example, exports of high-technology goods are less price elastic). We could conclude, that price competitiveness was not a problem for Bulgaria and Romania during the period of investigation. The relative prices had a slight negative contribution to Bulgarian exports and almost no contribution to Romanian exports (see Graph 7.1). This result suggests that most of the trend appreciation of the real exchange rate in both countries is an equilibrium development, not a loss in price competitiveness.

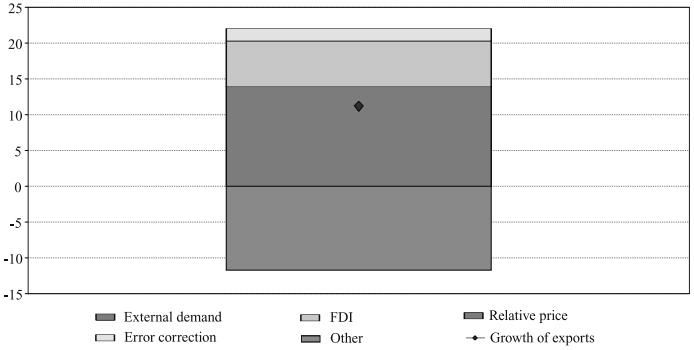
The contribution of others (constant, seasonals and residual) for both countries is negative, although to a lesser extent in Bulgaria (see Graph 7.1). This could include the overall business climate, the sectoral orientation of trade, or non-price competitiveness indicators that are not captured in the estimation.

Graph 7.1

**ACCOUNTING FOR BULGARIAN AVERAGE EXPORT GROWTH, 2000–2008**
**(CONTRIBUTION OF DETERMINANTS)**

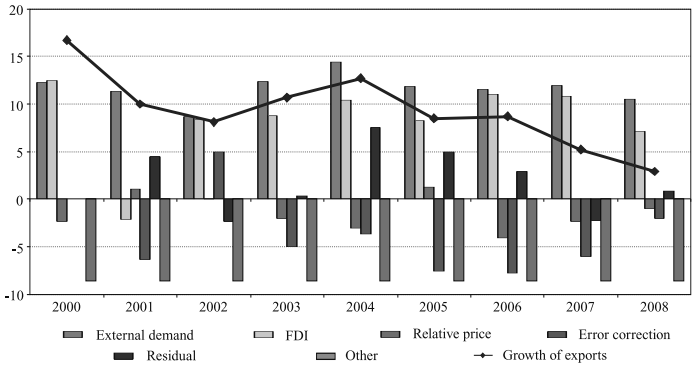



**ACCOUNTING FOR ROMANIAN AVERAGE EXPORT GROWTH, 2000–2008**
**(CONTRIBUTION OF DETERMINANTS)**

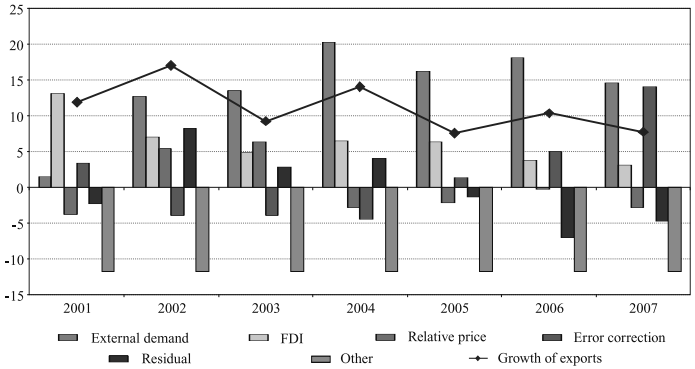


Graph 7.2

**DYNAMIC CONTRIBUTIONS TO BULGARIAN EXPORTS**




**DYNAMIC CONTRIBUTIONS TO ROMANIAN EXPORTS**




Concerning the imports, strong domestic demand played a key role for both countries as expected (see Graph 7.3). The elasticities of imports of both countries to domestic demand is around two, illustrating high elasticity to domestic demand. The inelasticity of import with respect to import price in Bulgaria and Romania implies that during the period of investigation, imports were largely determined by non-price factors. By contrast with the export equations, the other factors (constant, seasonals and residual) are positive which pushed up the growth rate of imports. This could include FDI, for example, which is not included in the estimation.

As import demand is income elastic in the long run, economic growth may have negative implications on the balance of payments in Bulgaria and Romania. In order to mitigate these negative effects, governments strategies should promote the development of domestic capital goods industries and also industries that produce consumption and intermediate goods that are competitive in terms of price and quality to imports.

Table 7.3

**IMPORTS LONG-TERM ELASTICITIES RELATED TO NON-PRICE COMPETITIVENESS**

| | Bulgaria | Romania |
|---|---|---|
| Domestic demand | 2.29 | 1.63 |

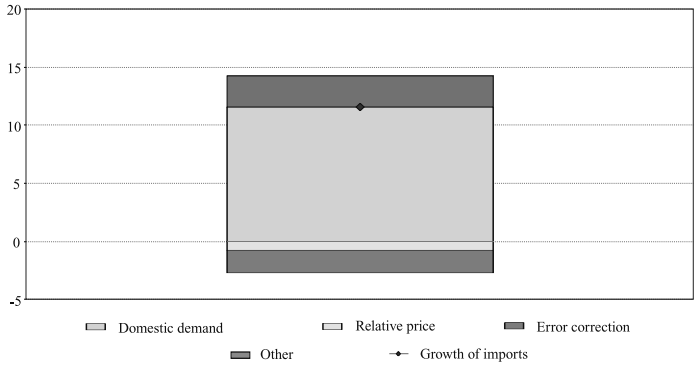
Table 7.4

**IMPORTS LONG-TERM ELASTICITIES TO PRICE COMPETITIVENESS**

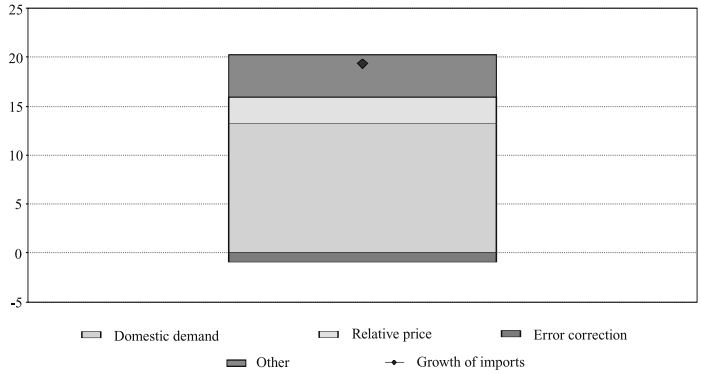
| | Bulgaria | Romania |
|---|---|---|
| Relative price | -0.20 | -0.12 |

Graph 7.3

**ACCOUNTING FOR AVERAGE BULGARIAN IMPORT GROWTH, 2000–2008**
**(CONTRIBUTION OF DETERMINANTS)**

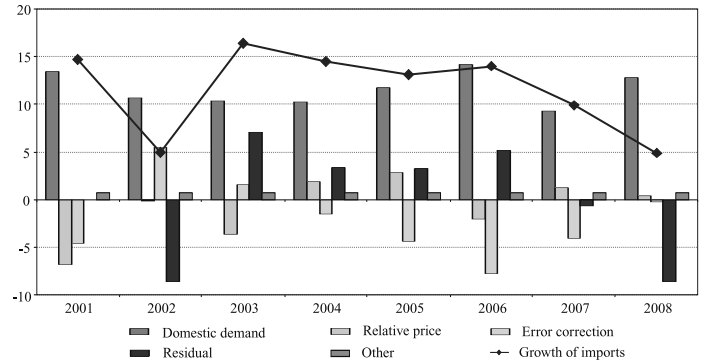


**ACCOUNTING FOR AVERAGE ROMANIAN IMPORT GROWTH, 2000–2008 (CONTRIBUTION OF DETERMINANTS)**

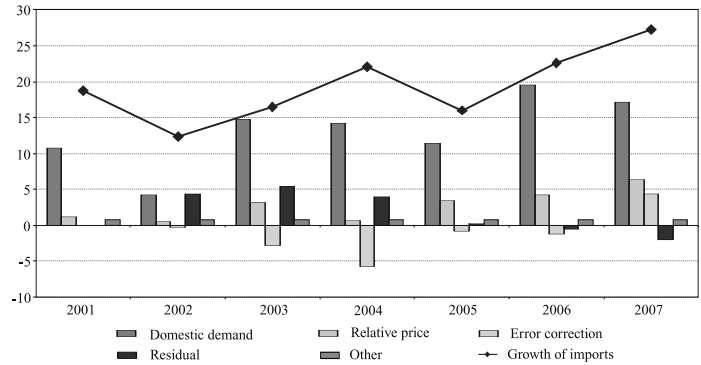



Graph 7.4

**DYNAMIC CONTRIBUTIONS TO BULGARIAN IMPORTS**




**DYNAMIC CONTRIBUTIONS TO ROMANIAN IMPORTS**



If we extend the sample till the fourth quarter of 2010 as the data are available to this date, a structural break occurs and the results are difficult to interpret. However, several important points could be emphasized for the period of the global economic crisis. While Bulgaria and Romania entered the period of global turmoil from a strong competitive position, their reliance on global and domestic demand had a negative impact on trade flows. The relatively high elasticities to external demand had a big impact on exports (the volume of Bulgarian exports declined by 11.2 per cent in 2009 and the volume of Romanian exports declined by 5.3 per cent, supported by the empirical results that Bulgarian exports have higher elasticity to external demand compared to Romanian exports). Also, in both countries imports declined because of the decrease in domestic demand. Furthermore, the elasticities of imports to domestic demand are higher than elasticties to external demand which explains why imports declined by more than exports in both economies (the volume of Bulgarian imports declined by 21 per cent in 2009 and the volume of Romanian imports declined by 20.9 per cent).

## VIII. Conclusions

The paper provides insights in the trade determinants of Bulgaria and Romania which recently became EU members in the context of the convergence process and also in relation to different exchange rate regimes. The global and domestic acceleration explain a significant part of export and import developments in both countries during the period 2000–2008. The pickup in growth in the EU explains to a large extent the export growth in Bulgaria and Romania. This study also shows that over the period of investigation Bulgaria and Romania were able to increase their market share, partly due to strong FDI inflows.

The key conclusion is that price competitiveness does not appear to have significant impact on trade developments in Bulgaria and Romania. Despite rapid exchange rate appreciation, which was more prominent in Romania than in Bulgaria, although the latter is with fixed exchange rate, relative prices remained muted. The evolution of relative price had a negligible negative contribution to Bulgarian exports and almost no contribution to Romanian exports. As for imports, the relative prices boosted imports for Romania and had a very small negative contribution for Bulgaria. These results suggest that most of the trend appreciation of real exchange rate reflects more a shift of an equilibrium value, not a loss in price competitiveness.

Overall, we could conclude that the convergence process in respect to trade in both economies is similar over the period of investigation irrespective of their exchange rate regime, currency board or managed float.

# Appendix I

## *Currency board arrangement in Bulgaria*

The operation of the currency board in Bulgaria is based on three major principles laid down in the Law on the BNB, namely: (1) a fixed exchange rate which as of the moment of the euro introduction is BGN 1.95583 per EUR 1; (2) the total amount of BNB monetary liabilities is fully covered by full high-liquid foreign reserves. BNB monetary liabilities consist of banknotes and coins in circulation, liabilities vis-à-vis banks, the government and budget organizations, liabilities to other depositors (see Issue Department balance sheet on the BNB website); (3) the central bank's obligation to unconditionally and irrevocably sell and purchase levs against euro at the exchange rate fixed by the Law on the BNB. These principles mean that the national currency is issued solely against providing reserve currency at the fixed exchange rate.

The currency board and the fixed exchange rate are further protected by the following provisions in the Law on the BNB:

(1) The BNB may not extend loans and guarantees in any form whatsoever, including through purchase of debt instruments, to the Council of Ministers, municipalities, as well as to other government and municipal institutions, organizations and enterprises. This provision excludes the possibility, in order to support the government in financing budget expenditure, to issue national currency beyond the limit corresponding to the currency board principles.

(2) The Bank may not provide credit to banks except in the case of liquidity risk threatening to affect the stability of the banking system. The terms and procedure for extending this credit, and criteria for identifying the existence of liquidity risk are set by an ordinance of the BNB, and the credit is to be extended up to the amount exceeding the lev equivalent of gross international reserves vis-à-vis the total amount of BNB monetary liabilities. This provision also excludes the possibility, in order to support the banks, to issue national currency beyond the limit corresponding to the currency board principles.

(3) The BNB shall invest its gross international reserves in accordance with the principles and practices of prudent investment, with investments in securities being limited to liquid debt instruments satisfying the following requirements: debt instruments issued by foreign countries, central banks, other foreign financial institutions or international financial organizations, whereof obligations are assigned one of the two highest ratings by two internationally recognized credit rating agencies, and which are payable in freely convertible foreign currency. Rules for investing gross international reserves are also intended to protect the quality of assets in which these reserves are invested.

The above principles of the currency board operation guarantee an automatic mechanism of balancing national currency demand and supply at the fixed exchange rate determined by the law. Under the currency board, it is impossible that the issue of national currency exceeds the level of the gross international foreign exchange reserves, which could, otherwise, lead to erosion of the fixed exchange rate (a key difference between a currency board and a standard fixed exchange rate regime). The change in the level of BNB gross international reserves reflects the net result of demand for national currency by economic agents, government and banks, as well as changes in the market value of gold (as part of international reserves) and financial assets in which these reserves are invested.

Under the conditions of the fixed exchange rate against the euro and a free movement of capital, the BNB has no control over the interest rates and therefore, monetary conditions in Bulgaria follow to a great extent those in the euro area. Thus, the currency board largely reproduces the conditions in which the euro area economy is functioning.

The main instrument used by the BNB to affect monetary conditions is the regulation of the minimum required reserves maintained by banks with the central bank. For example, the reduction of the minimum required reserves rate since early 2009 has boosted liquidity in the banking system and contributed to falling interest rates in the interbank money market. It is possible for the central bank to indirectly influence the monetary conditions in Bulgaria by implementing supervisory and administrative measures but their objective is mainly financial stability rather than affecting monetary conditions.

Fiscal policy also may affect money supply and liquidity in the economy through a change in the amount of the government deposit with the BNB, the net government securities issuance and their maturity or repurchases. Withdrawal of funds from the government deposit at the BNB and their depositing on other banks' accounts may boost banking system liquidity.

The implementation of these macroeconomic policy instruments affects the level of international reserves. Any change in policies that lead to an increase of the required reserves that banks have to maintain with the BNB or fiscal policies that lead to increase in the deposit of the government with the BNB also lead to an increase of the international reserves and *vice–versa*. In this respect, the fluctuations in the level of the international reserves are mainly policy driven.

# Appendix II

## *Co-integration Tests*

Table 1

**TEST RESULTS FOR UNIT ROOTS FOR EXPORTS VARIABLES FOR BULGARIA**

| Variable | ADF level | First difference | PP level | First difference |
|---|---|---|---|---|
| LE_EX_R (exports) | -0.962892 | -2.548061* | -2.468044 | -11.02786* |
| LRP (relative price) | -2.344142 | -4.089647* | -2.696441 | -4.153125* |
| LE_FDI_R (FDI) | -3.048278 | -7.000493* | -3.660610 | -7.000493* |
| LA_WTV_R (ext. demand) | -2.274377 | -1.777185 | -1.464081 | -6.218769* |

*, ** and *** denote rejection of a unit root hypothesis based on MacKinnon's critical value at 1 per cent, 5 per cent and 10 per cent.

Table 2

**TEST RESULTS FOR UNIT ROOTS FOR IMPORT VARIABLES FOR BULGARIA**

| Variable | ADF level | First difference | PP level | First difference |
|---|---|---|---|---|
| LE_MP _R (imports) | -1.23821 | -3.003429** | -7.016183* | -22.99910* |
| LRELPR (relative price) | -1.679213 | -6.251493* | -1.561949 | -6.243422* |
| LR_DD_R (dom. demand) | -0.667590 | -4.110638* | -9.228513* | -16.01653* |

*, ** and *** denote rejection of a unit root hypothesis based on MacKinnon's critical value at 1 per cent, 5 per cent and 10 per cent.

Table 3

**TEST RESULTS FOR UNIT ROOTS FOR RESIDUALS OF EXPORT AND IMPORT EQUATIONS FOR BULGARIA**

| Variable | ADF level | PP level |
|---|---|---|
| Residuals (exports) | -3.990354** | -3.943055** |
| Residuals (imports) | -3.347157** | -3.359132** |

*, ** and *** denote rejection of a unit root hypothesis based on MacKinnon's critical value at 1 per cent, 5 per cent and 10 per cent.

Table 4

**TEST RESULTS FOR UNIT ROOTS FOR EXPORTS VARIABLES FOR ROMANIA**

| Variable | ADF level | First difference | PP level | First difference |
|---|---|---|---|---|
| LE_EX_R (exports) | -1.718113 | -8.893079* | -4.087559** | -10.51416* |
| LA_REER_R (real effective ER) | -1.428654 | -4.683814* | -1.512948 | -4.742796* |
| LE_FDI_R (FDI) | -0.667553 | -3.730669* | -0.635338 | -3.656584** |
| LA_WTV_R (ext. demand) | -3.267192 | -3.991536* | -3.838937** | -7.376505* |

*, ** and *** denote rejection of a unit root hypothesis based on MacKinnon's critical value at 1 per cent, 5 per cent and 10 per cent.

Table 5

**TEST RESULTS FOR UNIT ROOTS FOR IMPORT VARIABLES FOR ROMANIA**

| Variable | ADF level | First difference | PP level | First difference |
|---|---|---|---|---|
| LE_MP _R (imports) | -1.586173 | -3.950805* | -4.759125** | -10.94347* |
| LRELPR (relative price) | 1.091090 | -1.453922 | -3.720417** | -7.452448* |
| LR_DD_R (dom. demand) | -2.067721 | -1.938260 | -7.289733* | -12.84323* |

*, ** and *** denote rejection of a unit root hypothesis based on MacKinnon's critical value at 1 per cent, 5 per cent and 10 per cent.

Table 6

**TEST RESULTS FOR UNIT ROOTS FOR RESIDUALS OF EXPORT AND IMPORT EQUATIONS FOR ROMANIA**

| Variable | ADF level | PP level |
|---|---|---|
| Residuals (exports) | -3.271897** | -3.080868** |
| Residuals (imports) | -4.175699* | -4.171295* |

*, ** and *** denote rejection of a unit root hypothesis based on MacKinnon's critical value at 1 per cent, 5 per cent and 10 per cent.

# Appendix III

## *Estimated equations*

**Exports (Bulgaria)**

ln(E_EX_R_STAR)=1.64+0.96ln(A_WTV_R)-0.08ln(E_EX_P/(A_MEPAE_P*A_ER_PI)+0.20*ln(E_FDI_N/R_KF_P)+seasonals

standard error of regression=0.05 DW=1.68 t statistics are in parentheses

dln(E_EX_R)=-0.96 - 0.78(ln(E_EX_R(-1)-ln(E_EX_R_STAR(-1)))+1.32dln(A_WTV_R)-
(13.62) (3.66) (1.61)

-0.21dln(E_EX_P/(A_MEPAE_P*A_ER_PI))+0.50dln(E_FDI_N/R_KF_P)+seasonals
(1.41) (1.97)

Adj. $R^2$=0.99 standard error of regression=0.05
where
E_EX_R – real exports
A_WTV_R – external demand
E_EX_P – export deflator
A_MEPAE_P – competitor's price in US dollar
A_ER_PI – exchange rate BG currency per US dollar
E_FDI_N – FDI accumulated inflows without real estate (nominal value)
R_KF_P – Investment deflator

**Exports (Romania)**

ln(E_EX_R_STAR)=4.13+0.78ln(A_WTV_R)-0.10ln(E_EX_P/(A_MEPAE_P*A_ER_PI)+0.19*ln(E_FDI_N/R_KF _P)+seasonals

standard error of regression=0.04 DW=0.39 t statistics are in parentheses

dln(E_EX_R)=0.07 - 0.18(ln(E_EX_R(-1)-ln(E_EX_R_STAR(-1)))+0.70dln(A_WTV_R)-
(1.25) (1.39) (1.57)

+0.08dln(E_EX_P/(A_MEPAE_P*A_ER_PI))+0.17dln(E_FDI_N/R_KF _P)+seasonals
(1.27) (1.37)

Adj. $R^2$=0.14 standard error of regression =0.02
where
E_EX_R – real exports
A_WTV_R – external demand
E_EX_P – export deflator
A_MEPAE_P – competitor's price in US dollar
A_ER_PI – exchange rate RO currency per US dollar
E_FDI_N – FDI accumulated inflows without real estate (nominal value)
R_KF_P – Investment deflator

**Imports (Bulgaria)**

ln(E_MP_R_STAR)=-10.81+2.29ln(R_DD_R)-0.20ln(E_MP_P/R_GDP_P)+seasonals

standard error of regression=0.11 DW=1.51 t statistics are in parentheses

dln(E_MP_R)=-0.88 - 0.67(ln(E_MP_R(-1 ) -ln(E_MP_R_STAR(-
(20.86) (3.46)

1))) + 4.19dln(R_DD_R) - 0.20dln(E_MP_P/R_GDP_P)+seasonals
(1.47) (1.75)

Adj. $R^2$=0.97 standard error of regression=0.10
where
E_MP_R – real imports
R_DD_R – domestic demand
E_MP_P – import deflator
R_GDP_P – GDP deflator

**Imports (Romania)**

ln(E_MP_R_STAR)=-7.44+1.63ln(R_DD_R)-0.12ln(E_MP_P/R_GDP_P)+seasonals

standard error of regression=0.03 DW=1.96 t statistics are in parentheses

dln(E_MP_R)=-0.11 - 0.78(ln(E_MP_R(-1 ) -ln(E_MP_R_STAR(-
(1.45) (2.53)

1))) + 0.99dln(R_DD_R) - 0.27dln(E_MP_P/R_GDP_P)+seasonals
(2.06) (1.47)

Adj. $R^2$=0.92 standard error of regression=0.03
where
E_MP_R – real imports
R_DD_R – domestic demand
E_MP_P – import deflator
R_GDP_P – GDP deflator

# Appendix IV

## *Principle of dynamic contributions*[7]

Let $Y_t$ be the endogenous variable, $X_i$ the explanatory variables, and $\varepsilon_t$ the econometric residual.

The ECM can be written as

$$\Delta LogY_t = c_0 + \sum_{i=1}^{n}\sum_{j=1}^{p} b_{i,\,j}\Delta LogX_{i,\,t-j} - \lambda ECM_{-1} + \varepsilon_t \qquad (1)$$

where $ECM = LogY_t - \sum_{i=1}^{n} \alpha_i LogX_{i,\,t}$ is determined by the co-integration relationship.

**Breakdown by explanatory variables**

The estimated full dynamic can be summarized as

$$A(L)LogY_t = c_0 + \sum_{i=1}^{p} b_j(1-L)L^j - \lambda\alpha_i L,$$

where $L$ is the lag operator, and $A(L)$ and $B_i(L)$ polynomials of this lag operator.

From (1), $A(L) = 1 - L - \sum_{j=1}^{p} c_j(1-L)L^j - \lambda L$ and $B_i(L) = \sum_{j=0}^{p} b_j(1-L)L^j - \lambda\alpha_i L$.

By inverting $A(L)$, one gets: $LogY_t = \frac{c_0}{A(L)} + \sum_{i=1}^{p} \frac{B_i(L)}{A(L)}\Delta LogX_{it} + \frac{\varepsilon_t}{A(L)}$

The dynamic contributions of variables $X_i$ to the growth rate of variable $Y$ are then derived (additively) from the differentiation of (1):

$$\Delta LogY_t = \sum_{i=1}^{p} \frac{B_i(L)}{A(L)}\Delta LogX_{it} + \frac{\Delta\varepsilon_t}{A(L)} \qquad (2)$$

This breakdown also allows one to visualize what remains unexplained in the econometric relationship, through the contributions of the residuals.

[7] It follows Allard (2009).

**Breakdown between short-and long- term dynamics**

Another presentation consists in distinguishing between the contribution of the short-term dynamic, through all the variables in growth rate in equation (1), and the long-term dynamic, through the impulse from the error-correcting term:

$$A^*(L)LogY_t = c_0 + \sum_{i=1}^{n}\sum_{j=1}^{p} b_{i,\,j}\Delta \log X_{i,\,t-j} - \lambda ECM_{-1} + \varepsilon_t$$

where $A^*(L) = (1-L)(1-\sum_{j=1}^{p} c_j L^j$

By inverting $A^*(L)$, one gets:

$$\Delta LogY_t = \frac{c_0}{A^*(L)} + \sum_{i=1}^{p}\frac{B_i(L)}{A^*(L)}\Delta LogX_{it} - \frac{\lambda L}{A^*(L)}ECM + \frac{\varepsilon_t}{A^*(L)} \qquad (3)$$

The first two elements on the right side of (3) – the constant and the terms with the growth rate of $X_i$ variables – correspond to the contribution of the short-term dynamic, whereas the term with the error-correcting factor shows the contribution of the long-term dynamic namely, by how much the gap from the steady state equilibrium contributes to the growth rate of variable *Y*. Here again, the breakdown also allows one to visualize what remains unexplained in the econometric relationship, through the contribution of the residuals.

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DP/86/2011

# Short-Term Forecasting of Bulgarian GDP Using a Generalized Dynamic Factor Mode

Petra Rogleva

**Abstract.** In the present paper we utilize the Generalized Dynamic Factor Model proposed by Forni et al. [2002] to construct a short-term forecast of the real GDP in Bulgaria using a large data set of 140 indicators from all sectors of the economy. A simple method is described for selecting a smaller subset of data series that provides better forecasts. Even in this case the number of variables used for the forecasts is still much higher than that in the clasical multivariate time series models. The latest available observations of the series with smaller publication delay are also exploited to capture the most recent developments in the economy.

**Резюме.** В настоящото изследване е приложен общият динамичен факторен модел, предложен от Forni et al. (2002) за конструиране на краткосрочна прогноза на БВП на България в реално изражение, като се използва набор от големи данни за 140 индикатора от всички сектори на икономиката. Описан е прост метод за подбор на един по-малък поднабор от динамични редове, което позволява по-точно прогнозиране. В този случай дори редица променливи, използвани в прогнозата, още са доста по-високи, отколкото в класическите модели с многовариантни времеви редове. Използвани са и последните налични наблюдения на тези редове при малко закъснение с публикуването им, за да се уловят най-новите тенденции в икономиката

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## Contents

# 1 Introduction

The assessment of the current economic situation together with forming an expectation for the next few quarters ahead is an important input in the creation of medium to long-term forecasts and in the decision making process as a whole. Whereas mainly structural models are exploited for medium to long-term forecasts, researchers and practitioners put more efforts in extracting and summarizing information from the great variety of sources available nowadays for the short-run. Both nowcasting and short-term forecasting require focusing on time series data that can provide information on the current state of the economy and the number of potentially useful series can be very large. Dynamic factor models have been successfully applied in a number of papers to forecasting US, euro area and country specific macroeconomic variables, including Stock and Watson (2002), Marcellino *et al.* (2003), Schneider and Spitzer (2004) and Artis *et al.* (2007). The main characteristic of factor models is that they can exploit information from large data sets, while in classical time series models the number of parameters increases quickly

with the number of variables modeled, so that usually only univariate or small-scale multivariate models are considered.

One of the specifics of modeling Bulgarian macroeconomic variables is that the number of observations is very small because Bulgaria's transition to market economy started in the beginning of 90's. The short history hinders the use of traditional parametric econometric models and can give additional advantage to dynamic factor models.

The dynamic factor approach is not new for the Bulgarian economy but is still relatively little explored. In Vassileva (2006) a dynamic factor model is used to produce two indicators for the Bulgarian economy. The first one is developed to forecast the nominal GDP and the second — to summarize the current tendencies in the economy on monthly basis. The approach in the present paper differs from the one in Vassileva (2006) in that it is focused on nowcasting and short-term forecasting of the real GDP and in the methodology for selection of variables and model specification.

The basic idea underlying dynamic factor analysis (as in Sargent and Sims (1977) and Geweke (1977)) is that the comovements in a large set of time series can be explained by a small number of unobserved variables, called common factors or common shocks. The models assume that each time series in the panel can be expressed as the sum of two orthogonal components. The first one is a common component, which should explain the main part of the

variance of the time series and is driven by the common factors. The second one is a variable specific idiosyncratic component.

In the present paper, we use the Generalized Dynamic Factor Model (GDFM) of Forni *et al.* (2002) to produce a short-term forecast of real Bulgarian GDP from one to four quarters ahead. As the first estimate of the GDP for the last quarter is available almost at the end of the next one, the one-step ahead forecast of the output is practically equivalent to a nowcast — a forecast of the present. Even if the flash estimate of GDP were used one still will have to wait until the middle of the next quarter when all short-term business statistics, surveys and financial data for the last quarter are already published. We have collected 140 real-activity, survey and financial series with monthly and quarterly frequencies. The latest observations of series with a smaller publication delay which are available for the current quarter are used to produce a nowcast of GDP. The latest available information is expected to be beneficial to the forecasts for further periods as well. To deal with a dataset with end-of-sample unbalancedness, *i.e.* when the latest observations for some of the variables in the data set are missing, we use an approach similar to the one used by Altissimo *et al.* (2001).

Forni *et al.* (2002) and Forni and Lippi (2001) prove that their method gives a forecast that is a consistent estimator of the optimal h-step ahead forecast as both the size of cross-section and the series length go to infinity. How-

ever, there are some results which indicate that increasing the number of variables over a certain size does not improve, or even worsens forecasting results (Schneider and Spitzer (2004), Bai and Ng (2002)). In this paper we use a simple method for selecting a subset of all the variables collected. The criterion for inclusion of a variable is based on the relative performance of the model in a pseudo-real time forecasting exercise with and without the given variable. We achieve better forecasting performance with a data set smaller than the full data set of 140 variables.

The paper is organized as follows. The next two sections briefly describe the GDFM and our data set. Section Four explains the empirical application of the model. Section Five describes how the latest available observations are exploited. Section Six concludes and outlines the directions for future work. Appendices A and B give technical details and a complete list of variables.

# 2 The Generalized Dynamic Factor Model

Dynamic factor analysis is based on the idea that the comovements in a large set of related time series can be explained by a small number of common factors and each time series can be decomposed as a sum of two orthogonal components. The common factors of the dataset drive the common component of each series and explain

the major part of the variance in the series. The second component is a variable specific idiosyncratic term. In traditional factor analysis (Sargent and Sims (1977) and Geweke (1977)), referred to also as exact factor models, it is assumed that there is no cross-correlation among the idiosyncratic components at any lead and lag. This assumption allows for identification of the models, but is unrealistic for most applications. As an example how idiosyncratic terms can interact with each other, Schneider and Spitzer (2004) describe the following situation. There are two industries and each of their productions consists of common and idiosyncratic components. If both of the sectors are connected with an input-output relationship then an idiosyncratic shock in one of them can affect the idiosyncratic term in the output of the other industry and this can happen with a lag. Thus, the assumption for uncorrelated idiosyncratic components appears unsuitable in our context.

Forni *et al.* (2000a) provide a generalization to these models which allows for some contemporaneous and lagged correlation between the idiosyncratic terms. Stock and Watson (2002) also propose a model allowing for mutual correlation in the idiosyncratic components. One of the advantages of the latter is its simpler estimator of the factors and that it requires only one parameter to be set — the number of the factors. Thus, the chance for the model to be misspecified decreases. However, the former model allows for richer dynamics when the factors are extracted.

This is a very desirable feature of the model and is exploited here not only with a view to capturing the lagged relationship between the variables but also for treatment of the end-of-sample unbalancedness, *i.e.* when the latest observations for some of the variables in the data set are missing.

The model utilized to develop a framework for short-term forecasting of real GDP in Bulgaria is the Generalized Dynamic Factor Model of Forni *et al.* (2002). This model elaborates the work of Forni *et al.* (2000a) and Forni and Lippi (2001), where the GDFM is introduced. Their estimator of the components is based on a two-sided filtering of the observable variables and exploits past, present and future observations. This feature causes problems for the estimation at the end of the sample and is highly undesirable in forecasting. Forni *et al.* (2002) exploit the dynamic techniques developed in Forni *et al.* (2000a) to obtain an estimate of the cross-covariance matrices of common and idiosyncratic components at all leads and lags and then, under some additional restrictions for the structure of the model, they obtain a consistent estimator (for both cross-section and time dimensions going to infinity) of the optimal linear predictor of the common component. This estimator exploits only past and present observations. In Section 2.1 we present the model with some of its main features and in Section 2.2 we briefly describe the estimation procedure.

## 2.1 The Model

Let $X_n^T = \{x_{it}, i = 1, \ldots, n, t = 1, \ldots, T\}$ denote the observations in a data set of $n$ time series at periods of time $t = 1, \ldots, T$. We assume that $X_n^T$ is a finite realization of a real-valued stochastic process $X = \{x_{it}, i \in \mathbb{N}, t \in \mathbb{Z}\}$, where for any $n \in \mathbb{N}$, the $n$-dimensional vector process $\{\mathbf{x}_n = (x_{1t}, \ldots, x_{nt})', t \in \mathbb{Z}\}, n \in \mathbb{N}$ is weakly-stationary, with mean $\mathbf{0}_n$ and finite second order moments $\Gamma_{nk} = \mathbf{E}[\mathbf{x}_{nt}, \mathbf{x}'_{n,t-k}]$, for $k \in \mathbb{N}$. In practice this assumption cannot be verified for a particular dataset. The common way to try to fulfill it is by transforming the data so that the trend and the seasonality be removed.

The GDFM suggests that each variable $x_{it}$, $i = 1, \ldots, n$ can be represented as the sum of two, mutually orthogonal, unobserved components: the common component, $\chi_{it}$, and the idiosyncratic component, $\xi_{it}$. The common component is driven by $q$-dimensional vector of common factors ($q$ is typically much smaller than $n$). These factors are the same for all variables in the panel but loaded with different coefficients and lag structure.

More precisely,

$$x_{it} = \chi_{it} + \xi_{it} \tag{1}$$

$$= b_{i1}(L)u_{1t} + b_{i2}(L)u_{2t} + \ldots + b_{iq}(L)u_{qt} + \xi_{it}$$

$$= \mathbf{b}_i(L)\mathbf{u}_t + \xi_{it},$$

where $L$ is the lag operator, and $\mathbf{u}_t = \{(u_{1t}, \ldots, u_{qt})', t \in$

$\mathbb{Z}\}$ is the vector of common factors and is orthonormal white noise, and the processes $\{\mathbf{u}_t, t \in \mathbb{Z}\}$ and $\{\xi_{it}, i = 1, \ldots, n, t \in \mathbb{Z}\}$ are mutually orthogonal, hence the common and the idiosyncratic components are mutually orthogonal; and $b_{ij}(L) = \sum_{k=0}^{\infty} b_{ij,k} L^k$, $i = 1, \ldots, n$, $j = 1, \ldots, q$ are $n \times q$ square-summable filters, called factor loadings.

The eigenvalues of the spectral density matrix of the variables show what share of the total variation in the data set can be explained by a particular factor. If $\lambda_{nk}(\theta)$ is the $k$-th largest eigenvalue at frequency $\theta$ of the spectral matrix $\Sigma_n(\theta)$ of $\{\mathbf{x}_{nt}, t \in \mathbb{Z}\}$, then

$$\frac{\lambda_{ni}(\theta)}{\sum_{j=1}^{n} \lambda_{nj}(\theta)}$$

gives the contribution of the $i$-th common factor to the total variance at frequency $\theta$. Forni and Lippi (2001) prove that there exists a $q$-dimensional white noise process $\{\mathbf{u_t}, t \in \mathbb{Z}\}$, satisfying the assumptions of the model if and only if it holds that

> $\lambda_{nq}(\theta) \to \infty$, as $n \to \infty, \theta$-a.e. in $[-\pi, \pi]$ and there exists $\Lambda \in \mathbb{R}$ such that $\lambda_{n,q+1}(\theta) \leq \Lambda$, for any $\theta \in [-\pi, \pi]$, and any $n \in \mathbb{N}$.

With some oversimplification this condition ensures that: 1) each common factor affects infinitely many items of the cross-section as $n$ increases; and 2) a limited amount

of cross-correlation among the various idiosyncratic components is allowed. So, this condition relieves the condition for orthogonality of the idiosyncratic components in the exact dynamic factor model.

The same condition also suggests a criterion for choice of the number $q$ of the common factors. If we set

$$\lambda_{in} = \int_{\theta\in[-\pi,\pi]} \lambda_{in}(\theta)d\theta, \qquad i = 1, \ldots, n,$$

to be the aggregated eigenvalues over all frequencies, then for large $n$, we expect that the first $q$ aggregated eigenvalues are sizably bigger then the $(q+1)$-th one, *i.e.* there is a substantial gap between $\lambda_{qn}$ and $\lambda_{q+1,n}$.

Forni *et al.* (2000a) prove that under certain assumptions, the model (1) is identified in the sense that the components $\chi_{it}$ and $\xi_{it}$ are uniquely determined. They also construct a consistent finite-sample estimator of the components but using a two-sided filter. The modification proposed in Forni *et al.* (2002) makes the model more appropriate for end-of-sample estimation and forecasting, and requires a more restrictive structure of the factor loadings. It is assumed that the common components $\boldsymbol{\chi}_{nt}$ follow a $VARMA(S, s)$ structure of the form

$$\boldsymbol{\chi}_{nt} = \mathbf{B}_n(L)[\mathbf{A}(L)]^{-1}\mathbf{u}_t,$$

where $\mathbf{B}_n(L) = B_0^n + B_1^n L + \ldots + B_s^n L^s$ is a $n \times q$ matrix

polynomial [1] in the lag operator $L$ of order $s$, with $B_s^m \neq \mathbf{0}$, for some $m$; and $\mathbf{A}(L) = \mathbf{I} - A_1 L - \ldots - A_S L^S$ is a $q \times q$ polynomial of order $S$ and $S \leq s + 1$.

For fixed $k$, $B_k^n$ are nested for $n \in \mathbb{N}$, so if we add more series to $\mathbf{x}_{nt}$ and the number of series $n$ increases, the factor loadings of the old series won't be changed. This together with $B_s^m \neq \mathbf{0}$, for some $m$ implies that $B_s^n \neq \mathbf{0}$, for $n \geq m$ and guarantees that at least one of the factors is loaded with its $s$-th lag at some of the common components.

Actually the dynamic model (1) can be rewritten in a static form: for

$$\mathbf{f}_t := (f_{1t}, \ldots, f_{qt})' = [\mathbf{A}(L)]^{-1}\mathbf{u}_t$$

and $r := q(s+1)$, $\mathbf{F}_t = (\mathbf{f}_t', \ldots, \mathbf{f}_{t-s}')'$ is a $r \times 1$ vector of, as they are referred to later, static factors. The model for $\mathbf{x}_{nt}$ becomes

$$\mathbf{x}_{nt} = \mathbf{B}_n(L)\mathbf{f}_t + \boldsymbol{\xi}_{nt} = B_0^n \mathbf{f}_t' + \ldots + B_s^n \mathbf{f}_{t-s}' + \boldsymbol{\xi}_{nt} = \mathbf{C}_n \mathbf{F}_t + \boldsymbol{\xi}_{nt},$$

with $\mathbf{C}_n = (B_0^n B_1^n \ldots B_s^n)$ - $n \times r$ matrix of coefficients.

## 2.2 The Estimation of Components

The procedure for estimation of common and idiosyncratic components of the variables consists of two main

[1] Each element of $\mathbf{B}_n(L)$ is a scalar polynomial in $L$ and $B_k^n$ is $n \times q$ matrix of coefficients premultiplying the variables in lag $k$.

parts[2]. Firstly, using the dynamic techniques in Forni *et al.* (2000a), estimates $\Sigma_n^{\chi T}(\theta)$ and $\Sigma_n^{\xi T}(\theta)$ of the spectral density matrices of $\boldsymbol{\chi}_{nt}$ and $\boldsymbol{\xi}_{nt}$ are constructed. From these spectral matrice estimators, the matrices $\Gamma_{nk}^{\chi T}$ and $\Gamma_{nk}^{\xi T}$ of the common and idiosyncratic auto-covariance matrices for all lags $k$ are obtained by applying an inverse Fourier transformation. The estimates of $\Gamma_{nk}^{\xi T}$ have a non-zero off-diagonal elements, as the different idiosyncratic terms are allowed to be correlated in all lags $k$. However Forni *et al.* (2002) gives some empirical evidence that forcing to zero the off-diagonal entries of the estimated $\Gamma_{n0}^{\xi T}$ improves forecasting performance when the number of the series $n$ is large with respect to the number of observations $T$. The explanation provided for their results is that the computation of $\Gamma_{n0}^{\xi T}$ brings some spurious large covariances, even when the true covariance is zero. They argue that when $n$ increases, the error obtained estimating $\Gamma_{n0}^{\xi T}$ increases much faster than the error of ignoring the true covariances and setting them to zero. Moreover, they show that replacing $\Gamma_{n0}^{\xi T}$ with any symmetric positive semi-definite matrix with bounded eigenvalues does not affect the consistency obtained. In our application of the model we also set to zero the off-diagonal entries of $\Gamma_{n0}^{\xi T}$ before computing the eigenvectors.

Secondly, the $r$-dimensional unobserved space spanned by the static factors is estimated by the space spanned by linear combinations of the observations. These lin-

[2]For further details see Appendix A.

ear combinations $\mathbf{W}_{nt}^{T} = (W_{nt}^{1T}, \dots W_{nt}^{rT})$ are such that the variance in their common part is the biggest for a given idiosyncratic variance. The weights for these combinations are achieved as a solution of the generalized eigenvalue problem of $\Gamma_{n0}^{\chi T}$ and $\Gamma_{n0}^{\xi T}$. Thus, time series are weighted according to their signal-to-noise ratios, *i.e.* the ratio between the variance in their common and idiosyncratic terms. This gives additional advantages of the model in a situation when there are sizable differences in the common-to-idiosyncratic variance ratios, which we take to be the case. For example, we expect the idiosyncratic variances in survey data to be much higher than in structural business statistics because of the source of data. The same holds for the index of industrial production in 'Mining and quarrying' compared to 'Manufacturing' because of the sizes of the sectors. However, the survey data is expected to contribute to forecast accuracy because it is designed to be leading for the rest of the indicators and this justifies its use.

The space spanned by $\mathbf{W}_{nt}^{T}$ is a consistent estimator of the space spanned by the static factors, as $n, T \to \infty$. Hence $\mathbf{W}_{nt}^{T}$ can consistently approximate any point in the common-factor space, including the common components $\boldsymbol{\chi}_{nt}$, as $n, T \to \infty$.

Since the idiosyncratic components are orthogonal to the common components, $\boldsymbol{\chi}_{nt}$ can be approximated by projecting the data $X_{n}^{T}$ on $\mathbf{W}_{nt}^{T}$. Similarly, forecasts of the common components ($k$-leads ahead) are obtained by

projecting $\boldsymbol{\chi}_{n,t+k}$ on $\mathbf{W}_{nt}^{T}$.

Forni *et al.* (2002) argue that, under certain conditions, the frequency domain approach by Forni *et al.* (2000a), which they use for their predictor, can provide a substantial improvement over the predictor proposed in Stock and Watson (2002) based on static principal components. The improvement can be expected when the various cross-sectional items differ significantly in the lag structure of the loadings. The methodology, which we use to deal with a dataset with end-of-sample unbalancedness (described in Section 5) results in applying the model to a dataset with a significant difference in the timing of the variables.

It should be stressed that $\mathbf{W}_{nt}^{T}$ is a consistent estimator for some basis of the space spanned by the factors, not for the factors themselves. The identification of the common factors and the coefficients of the filter $\mathbf{B}_n(L)$ calls for further informational and economic assumptions and is thoroughly discussed in Forni *et al.* (2007).

# 3 The Data

From a theoretical point of view, all available relevant variables should in principle be included in the data set as the GDFM is proved to give a forecast that is a consistent estimator of the optimal $h$-step ahead forecast as both the size of cross-section and the series length go to infinity. However, as explained in Forni *et al.* (2000b), in practice

it is not recommended to include variables which have small commonality and large idiosyncratic components, since the latter could survive aggregation and be wrongly interpreted as additional common factors. Schneider and Spitzer (2004) and Bai and Ng (2002) give evidence that forecasts based on a small dataset can outperform such based on a bigger one.

To find the balance between the large data set that can be beneficial for the forecast and the inclusion of variables which can worsen the results we employ a two-fold strategy. First, we collect a comprehensive data set. It combines more reliable variables like national account data and price indices with indicators with possibly bigger measurement errors and smaller common-to-idiosyncratic ratio. These could be variables from business surveys and production indices and they usually have smaller publication delay and give earlier indications on the latest economic developments. Second, we apply a criterion for selecting a smaller or optimal subset of the full dataset. We base our criteria on the relative performance of the model in a pseudo-real time forecasting exercise, described in Section 4.3.

Thus, our data set for Bulgaria comprises 140 monthly and quarterly series. We include national accounts data (real and nominal GDP and its components), labour market variables, industrial production and industrial and trade turnover, price indices (CPI, HICP and raw material prices), survey data (consumer and business surveys), external

trade data, monetary aggregates and interest rates, among others. To make the frequencies of the series into the data set equal, we choose to aggregate the monthly series to a quarterly frequency. In order to achieve stationary series the following transformations have been made. A fourth-seasonal difference was applied to series with pronounced seasonality and then for all series a first difference was taken. The initial range of the data set is from 2000 Q1 to 2009 Q2 and after this treatment the sample includes 33 observations. Finally, the series were taken in deviation from the mean and divided by the standard deviation to obtain results independent of the units of measurement. A complete list of the variables and their transformations is reported in Appendix B.

# 4 Forecast Evaluation

## 4.1 Overview

In this section we describe the application and the performance of the model presented in Section 2 for forecasting the Bulgarian real GDP. We also test the relative performance of the model with full data set of 140 variables and the selected smaller subset in our pseudo-real time forecasting exercise.

Let $\tilde{Y}$ be GDP at constant prices from 2000 Q1 to 2009 Q2. After the transformations described in Section 3 we obtain seasonally adjusted series in first differences

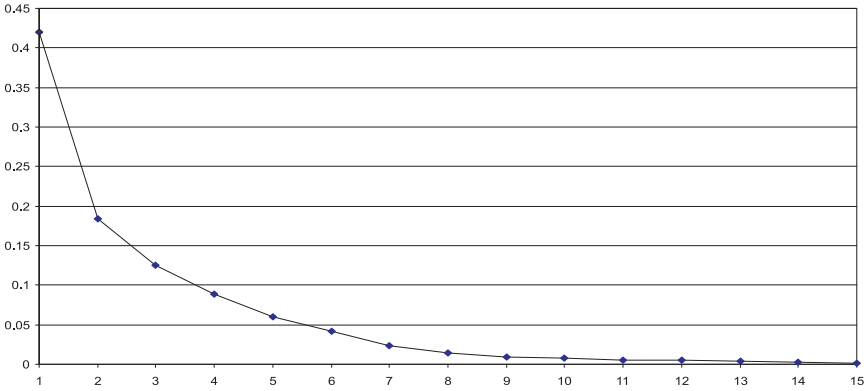
$Y = (1-L)(1-L^4)\tilde{Y}$ and normalized series $y = \frac{Y-\hat{\mu}}{\hat{\sigma}}$, where $\hat{\mu} = \frac{1}{T}\sum_{t=1}^{T} Y_t$, $\hat{\sigma} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(Y_t - \hat{\mu})^2}$ and $T$ denotes the sample size. The series $y$ is the variable we are modeling together with the other normalized series.

Since the common and the idiosyncratic components, say $\chi_y$ and $\xi_y$, in the decomposition of the transformed GDP $y$ are orthogonal at any lead and lag, they can be forecast separately. In view of the orthogonality or only weak cross-correlation between the idiosyncratic components of distinct cross-sectional items, Forni *et al.* (2002) propose that the forecast of $\xi_y$ be based on standard univariate or low-dimensional multivariate methods. However, the results from the pseudo out-of-sample exercise in D'Agostino and Giannone (2006) suggest that the idiosyncratic components are actually highly unforecastable. The authors conclude that *the common factors, constructed to explain the maximum amount of cross-sectional variance of the panel, are also able to capture all the predictable dynamics of the key aggregated variables.* We choose to ignore the idiosyncratic terms and our forecast of $y$ is obtained as a forecast of the common component $\chi_y$.

In addition, the parameters specifying the model have to be chosen. These parameters are the number of common factors $q$ and the order $s$ of the factor loading $\mathbf{B}_n(L)$. One possible test for choice of the number of factors is based on the aggregated eigenvalues in decreasing order $\bar{\lambda}_{jn}$ of the spectral density matrix of the panel[3]. It sug-

[3] $\bar{\lambda}_{jn}$ is the sum of the j-th eigenvalues of the spectral density

Figure 1: Share of the total variance explained by first 15 common factors




gests that $q$ should be chosen so that the gap between $\bar{\lambda}_{qn}$ and $\bar{\lambda}_{q+1,n}$ is more substantial than the differences between the other consecutive eigenvalues. Figure 1 displays the aggregated eigenvalues $\bar{\lambda}_{jn}$. We cannot find a substantial gap between any two consecutive eigenvalues except perhaps for the first and the second. Forni *et al.* (2000a) remark that setting the number $q$ bigger than its true value cannot have dramatic effects on estimation. As Table 1 shows, the first three common factors explain more than 70 per cent of the total variability and the fourth common factor would add only 9 percentage points to the total variance explained. Furthermore, this suggests that if the model is estimated with, for example, 3 common factors,

matrices calculated in 13 frequencies, equally spaced in the interval $[0, 2\pi]$ (see Appendix A).

then one can expect the variance of $\chi_y$ to be around 70 per cent of the variance of $y$. So a forecast for $Y$ to be derived, the predicted value for $\chi_y$ should be scaled with a coefficient $\rho$ bigger than the standard deviation of $Y$, $\hat{\sigma}$. In our application the model is specified by the parameters $q$, $s$ and $\rho$ and they are also determined according to the out-of-sample forecasting performance of the models.

Table 1: Variance explained by first 15 common factors

| Common factor | Share | Cumulated variance |
|---|---|---|
| 1 | 0.42 | 0.42 |
| 2 | 0.18 | 0.60 |
| 3 | 0.12 | 0.73 |
| 4 | 0.09 | 0.82 |
| 5 | 0.06 | 0.88 |
| 6 | 0.04 | 0.92 |
| 7 | 0.02 | 0.94 |
| 8 | 0.01 | 0.96 |
| 9 | 0.01 | 0.97 |
| 10 | 0.01 | 0.97 |
| 11 | 0.01 | 0.98 |
| 12 | 0.00 | 0.98 |
| 13 | 0.00 | 0.99 |
| 14 | 0.00 | 0.99 |
| 15 | 0.00 | 0.99 |

## 4.2 Forecasting Exercise

We evaluated the forecasting performance of a number of models which differ in their specifying parameters —

the number of dynamic common factors $q$, the maximal order of factor loadings $s$ and the scaling parameter $\rho$. We consider four forecasting horizons $h$ from one to four steps ahead and for each of them we choose the optimal set of parameters $(q_h^*, s_h^*, \rho_h^*)$. We set the parameter $q$ to vary in the range from 1 to 4. That means that up to 79 per cent of the total variability (for the full data set) is explained by the common factors. For $s$ we test values from 1 to 4. The upper bound of 4 corresponds to the assumption that none of the common factors is leading with more than one year for any of the observable economic indicators. We search the value for our scaling parameter $\rho$ in a wide grid of values $R$ around an approximate value[4] of the ratio of the standard deviation of $Y$ and the common component of $y$.

For each different combination of variables we estimate the forecasting performance in 17 rolling windows. First, we estimate the model specified by given values of $q$ and $s$ using observations from 2001 Q1 to 2005 Q1 (2005 Q1 is nearly the middle of the sample) and compute $h = 1, 2, 3, 4$-step ahead forecasts $y_{\tau+h|\tau}$ at time $\tau$=2005 Q1 of $y_{\tau+h}$. We then reestimate the model using one additional observation and compute $y_{\tau+h|\tau}$ for $\tau$=2005 Q2 and $h = 1, 2, 3, 4$. This is repeated 17 times until all available observations are added, from 2001 Q1 to 2009 Q2. As a result we achieve one vector of out-of-sample forecasts $y_{\tau+h|\tau}$

[4]We take $R$ as a grid of values around $\hat{\rho} = \sqrt{\frac{\sum_{j=1}^{n} \lambda_j}{\sum_{j=1}^{q} \lambda_j}}\hat{\sigma}$.

for each combination of forecasting horizon $h$, number of factors $q$ and maximal lag of the factor loadings $s$.

Furthermore, we add back the variance and the mean to the forecast $y_{\tau+h|\tau}$, $\tau = 2005Q1, \ldots, 2009Q2$ to produce a forecast for our non-normalized variable $Y_{\tau+h}$:

$$Y_{\tau+h|\tau} = y_{\tau+h|\tau}\rho + \hat{\mu}.$$

The forecast $Y_{\tau+h|\tau}$ already depends on the choice of the scaling parameter $\rho$. The forecast accuracy of the model is measured by $RMSE(h, q, s, \rho)$ which is the root mean squared errors between the observed transformed GDP $Y_{\tau+h}$ and its forecast $Y_{\tau+h|\tau}$:

$$RMSE(h, q, s, \rho) = \frac{1}{17-h}\sqrt{\sum_{\tau=2005:Q1}^{2009:Q2}(Y_{\tau+h} - Y_{\tau+h|\tau})^2}.$$

For a given data set and forecasting horizon we choose the model with minimal RMSE. It is specified by the parameters $(q_h^*, s_h^*, \rho_h^*)$ which are such that:

$$RMSE(h, q_h^*, s_h^*, \rho_h^*) =$$

$$min\Big\{RMSE(h, q, s, \rho) : q, s = \{1, 2, 3, 4\}, \rho \in R\Big\},$$
$$\text{for } h = 1, 2, 3, 4.$$

The measure $RMSE_h^* := RMSE(h, q_h^*, s_h^*, \rho_h^*)$ is used to assess the forecasting performance for a given data set.

## 4.3 Selecting an Optimal Subset of the Data Set

The criterion which we use to compare the different subsets of the data set is their corresponding $RMSE_h^*$ defined in the previous subsection. For each forecasting horizon, we would idealy be able to compare $RMSE_h^*$ for all possible subsets of the full data set of 140 variables and to choose the one with the smallest $RMSE_h^*$. Unfortunately, this calls for too many calculations and is not feasible. Instead we proceed as follows.

In the first step we sort the data set according to the contributions of the variables to the performance of the model. Let $X_n = (y, x_1, \ldots, x_n)$ be our complete data set, so $n = 139$, and let $X_n^j = (y, x_1, \ldots, x_{j-1}, x_{j+1}, \ldots, x_n)$ denote the set without the $j$-th variable. We estimate $RMSE_h^*$ for $X_n^j$, say $RMSE_h^j$, for $j = 1, \ldots, n$ and sort the variables $x_j, j = 1, \ldots, n$ in decreasing order according to $RMSE_h^j$. Thus we use the performance of the set $X_n^j$ as a measure of the importance of the variable $x_j$ for our forecast. Obviously the bigger $RMSE_h^j$ is, the more important $x_j$ is.

Once we have sorted the variables in the set, $X_{nh}^s = (y, x_{s1}^h, \ldots, x_{sn}^h)$, in the second step we start to exclude variables from the end of the sorted data set one by one. We calculate $RMSE_h^*$, say $RMSE_h^\nu$, for each subset $X_{nh\nu}^s = (y, x_{s1}^h, \ldots, x_{s\nu}^h)$, $\nu = 20, \ldots, n$. We choose $\nu$ to vary from 20 to $n$, because there are some limitations for the mini-

mal number of variables in the set[5]. Finally our optimal subset we choose is the set $X^s_{nh\nu}$ with minimal $RMSE^{\nu}_h$, denoted, respectively, by $X^{opt}_{nh}$ and $RMSE^{opt}_h$.

We repeat this procedure for every forecasting horizon $h = 1, 2, 3, 4$. In Table 2 we report, for each $h$, the number of variables in the optimal subset $X^{opt}_{nh}$, the optimal set of parameters and $RMSE^{opt}_h$, as well as $RMSE^*_h$ for the full data set. In this table we also show the relative improvement of the optimal subset on the full data set.

As Table 2 shows, the size of the optimal subsets varies widely among the horizons from 31 variables for forecasts one step ahead to almost the full data set of 138 variables for two steps ahead forecasts. However, a significant improvement in the performance is seen only in the one step ahead forecast where the $RMSE^{opt}$ is 33 per cent less than the $RMSE^*$ for the full data set. Although the $RMSE^{opt}$ for the other horizons is still smaller than $RMSE^*$, the improvement there does not seem significant.

The optimal subsets for the different forecasting horizons are indicated in Appendix B. The conclusion that can be made is that the subsets are quite different in respect to the included variables and a clear pattern for including or excluding of variables cannot be drawn. However, it should be noted that for all horizons there are representatives of the main groups of indicators like labour market, price indices, production and turnover indices, external

[5]For example if we want to estimate $r = q(s + 1)$ static factors we need at least $r$ variables in the set.

Table 2: Forecasting performance, using a balanced data set

| | h = 1 | h = 2 | h = 3 | h = 4 |
|---|---|---|---|---|
| Number of variables | 31 | 138 | 62 | 86 |
| Parameters | | | | |
| $q^*$ | 2 | 2 | 1 | 2 |
| $s^*$ | 2 | 4 | 1 | 4 |
| $\rho^*$ | $2.6\hat{\sigma}$ | $3.6\hat{\sigma}$ | $7.4\hat{\sigma}$ | $2.3\hat{\sigma}$ |
| $RMSE^{opt}$ | | | | |
| in levels | 151 986 | 208 230 | 254 894 | 258 075 |
| as a part of $RMSE^*$-full data set | 0.67 | 0.99 | 0.91 | 0.96 |
| $RMSE^*$ – full data set | | | | |
| in levels | 225 909 | 210 818 | 279 072 | 269 587 |

trade and consumer and business surveys from the four different sectors (construction, industry, retail trade and services). This provides one justification of the use of factor models and shows that potentially useful information is contained in a very wide range of data.

Figure 2 and Figure 3 show correspondingly the normalized and non-normalized output ($y_\tau$ and $Y_\tau$) and their best predictions $y_{\tau+h|\tau}$ and $Y_{\tau+h|\tau}$, for $h = 1, 2, 3, 4$. As it can be expected the fit of the series is better for the forecasts with shorter horizons. However, the graphs show that the direction of the changes in the predicted series is correctly matched in many of the data points even in the longer forecasting horizons.

In order to obtain forecast $\tilde{Y}_{\tau+h|\tau}$ for the real GDP $\tilde{Y}_{\tau+h}$, we use the predictions for $Y_{\tau+1}, \ldots, Y_{\tau+h}$:

$$\tilde{Y}_{\tau+h|\tau} = \tilde{Y}_\tau - \tilde{Y}_{\tau-4} + Y_{\tau+1|\tau} + \ldots + Y_{\tau+h|\tau} + \tilde{Y}_{\tau+h-4}.$$

Thus, the forecast for the level of GDP at constant prices in the second quarter of 2010, for instance, depends not only on the four-steps ahead forecast for the transformed GDP $Y_{\tau+4|\tau}$ in 2010 Q2 and the last observation of GDP in 2009 Q2 but also on the forecasts three-steps ahead for 2009 Q3, two-steps ahead for 2009 Q4 and one-step ahead for 2010 Q1. As a consequence the results for the longer horizons worsen not only because of the smaller predictive power of the model at these horizons but also because of the accumulation of errors of the forecasts for the previous quarters. The results are shown in Figure 4. As a next step growth rates could be calculated. However, again for the longer horizons the accumulated error worsens the results. A possible way to sidestep this problem is to model directly the growth rates or the first differences of the logarithms of the variables. Although additional work on this topic would be worthwhile, the preliminary results show much smaller commonality among the series in the data set when such transformations of the series are done.

Figure 2: Transformed and normalized real output and its best predictions 1, 2, 3 and 4 steps ahead, using a balanced data set

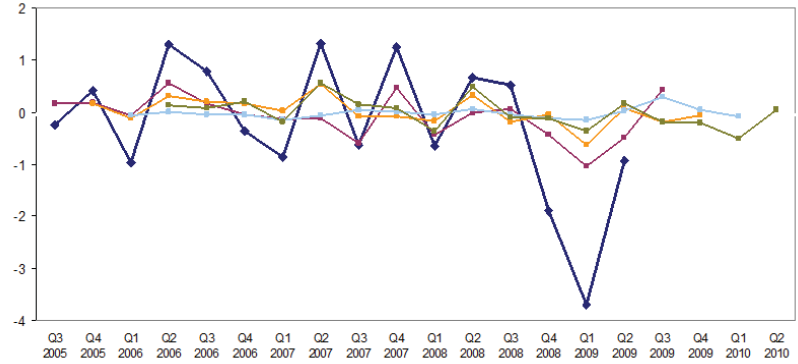



Figure 3: Transformed real output and its best predictions 1, 2, 3 and 4 steps ahead, using a balanced data set

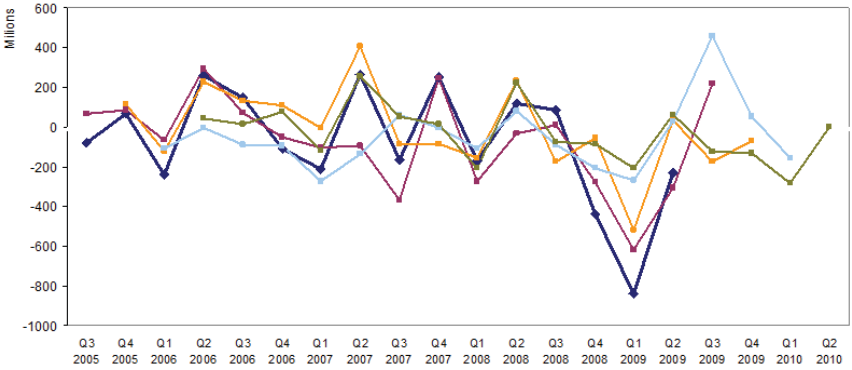
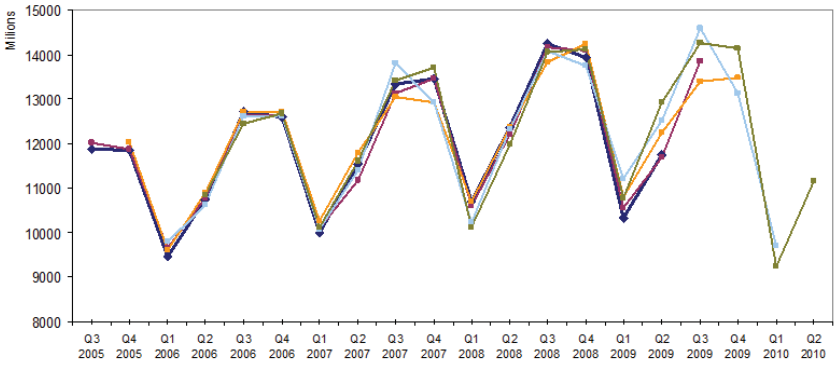


Figure 4: Real output and its best predictions 1, 2, 3 and 4 steps ahead, using a balanced data set




# 5 Using the Last Available Observations

The method described in Section 2 and applied in Section 4 has the feature that if at time $T$ we want to produce a forecast for time $T + h$, then we need observations for all variables until time $T$, *i.e.* we need a balanced data set. In the context of forecasting GDP this means that one-quarter ahead prediction for $T + 1$ can be made no sooner than 6 weeks after the end of the period $T$, when the flash estimate for Bulgarian GDP is published for $T$, or 10 weeks if we want to use the first estimate of GDP for period $T$. So, because of the publication delay, our forecast for $T + 1$ is made in the middle or almost at the end of period $T + 1$. This, in combination with the need for a balanced data set, creates the disadvantage that informa-

tion published during the first 6 (or 10) weeks after the end of period $T$ cannot be exploited. Since almost all of the variables have smaller publication delay (the surveys are published at the end of the same month, inflation is available half month later, *etc.*) the effects of this delay can be very substantial.

Altissimo *et al.* (2001) propose a method for treatment of an unbalanced dataset. In this section we exploit a similar idea for a dataset with observations available up to 2 weeks after the first release of the GDP for 2009 Q2. The method exploits the property of the GDFM to take into account the leading and lagging relations across series by means of principal components in the frequency domain. We shift series with available observations for the next period in the data matrix backward so that the latest available observation for each series can now be obtained at time T. For example, if a given variable is available up to period $T + 1$, it will be shifted back one period so that the last observation to be for period $T$ and the first observation will be deleted. So, instead of the variable itself we will use its lead. For variables with monthly frequency which are available for only one or two months of the next quarter this transposition is done before their aggregation to quarterly frequency. The GDFM is designed to be able to capture correctly the time structure and relations in the data set reconstructed this way. The rest of the procedure is the same as the one described in Section 4. It should be noted that all the results are dependent on the

cut off date for the data, which determines exactly which additional observations are included in the data set.

The one step ahead forecast in this case is a prediction for the GDP for the current quarter taking in account all available new information and is practically equivalent to a nowcast. Table 3 reports the number of the variables in the optimal subsets at the different horizons and the optimal model specifying parameters. Surprisingly the maximal lag of the factor loadings $s$ for forecasts one and two steps ahead is smaller for the unbalanced data set, which includes the last available observations, than for the balanced one. One possible explanation could be that some

Table 3: Forecasting performance, using the last available observations

| | h = 1 | h = 2 | h = 3 | h = 4 |
|---|---|---|---|---|
| Number of variables | 107 | 24 | 56 | 62 |
| Parameters | | | | |
| $q^*$ | 4 | 3 | 2 | 1 |
| $s^*$ | 1 | 1 | 2 | 4 |
| $\rho^*$ | $2.8\hat{\sigma}$ | $3.2\hat{\sigma}$ | $6\hat{\sigma}$ | $4.2\hat{\sigma}$ |
| $RMSE^{opt}$ | | | | |
| in levels | 112 588 | 170 256 | 194 158 | 198 068 |
| as a part of $RMSE^*$ for full data set | 0.72 | 0.68 | 0.72 | 0.72 |
| as a part of $RMSE^{opt}$ for balanced data set | 0.74 | 0.82 | 0.76 | 0.77 |
| as a part of $RMSE^*$ for full balanced data set | 0.50 | 0.81 | 0.70 | 0.73 |
| $RMSE^*$ - full data set | | | | |
| in levels | 157 298 | 249 302 | 268 663 | 275 614 |
| as a part of $RMSE^*$ for full balanced data set | 0.70 | 1.18 | 0.96 | 1.02 |

of the variables which have been shifted backwards in the reconstruction of the data set are in fact leading for GDP and this increases the commonality between variables in 0 or $\pm 1$ lag.

Considering the results of the model with the full data set, the inclusion of the last available observations reduces the root mean squared error significantly but only for one-step ahead forecast. The improvement for this horizon is 30 per cent (measured as $RMSE^*$ — full data set as a part of $RMSE^*$ for full balanced dataset), while for the other horizons the performance remains broadly the same. According to the selection of variables the results seem significantly better than the results from the balanced data set. The difference is that now improvement (measured as $RMSE^{opt}$ as a part of $RMSE^*$ for the full data set) is observed not only for the first horizon but for all of them and is around 30 per cent.

When selection of variables is done for both data sets, the one with included last available observations surpasses the one with balanced data set in all forecasting horizons. The root mean squared error improvements vary from 18 per cent for two-steps ahead forecast to 26 per cent for one-step ahead forecast. An interesting finding is that while for a forecast one-step ahead, the method for inclusion of the last available observations contributes for a better performance with or without selection of an optimal subset, for longer forecasting horizons an improvement is not observed for the full data set but only after selection of variables.

Predictions are shown in Figures 5, 6 and 7. A comparison between these figures and the analogous figures for the predictions with balanced data set (Figures 2, 3 and 4)

confirms the conclusion for improvement in the accuracy of the forecasts.

As a whole both methods applied here — first for selection of variables, and second for dealing with unbalanced data set which includes the last available information, bring an accumulated reduction of the root mean squared error in the forecasts up to 50 per cent for the forecast one-step ahead. For the longer horizons the improvement is smaller but still significant — 19 per cent for two steps ahead, 30 per cent for three steps ahead and 27 per cent for four steps ahead (Table 3, $RMSE^{opt}$ as a part of $RMSE^{*}$ for full balanced data set).

Figure 5: Transformed and normalized real output and its best predictions 1, 2, 3 and 4 steps ahead, using the last available observations

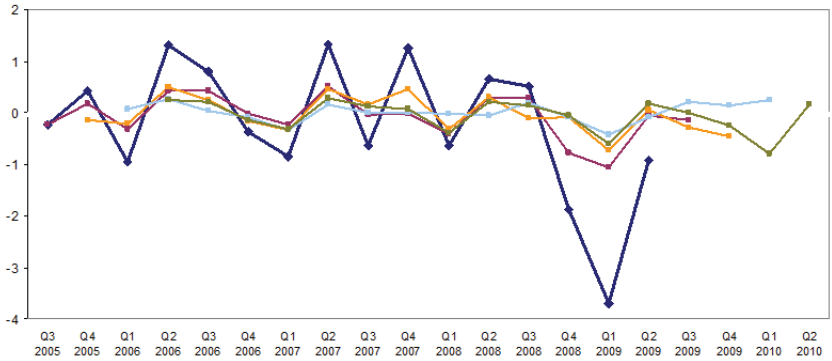


Figure 6: Transformed real output and its best predictions 1, 2, 3 and 4 steps ahead, using the last available observations

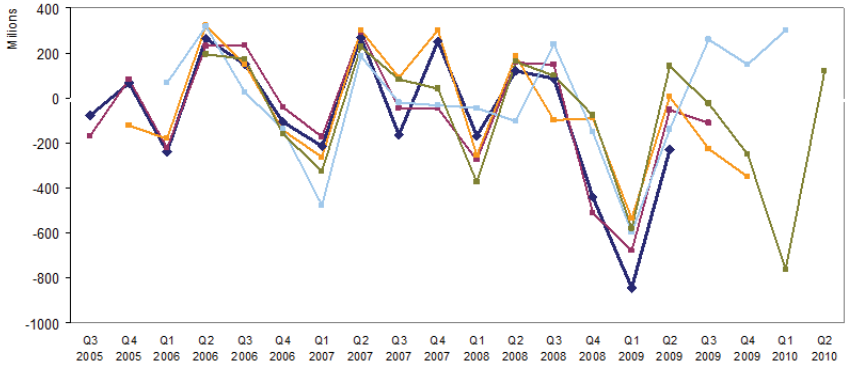
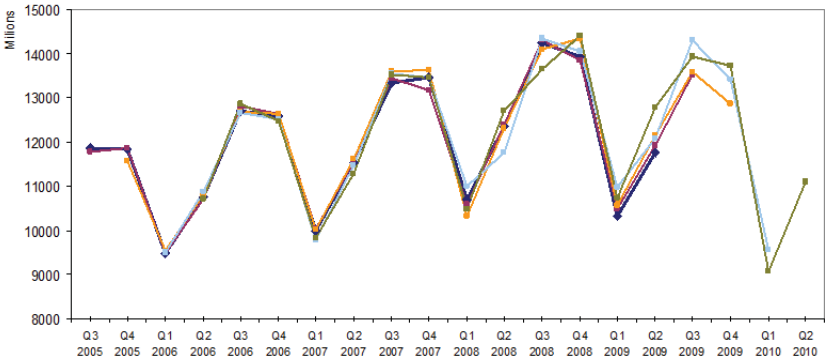



Figure 7: Real output and its best predictions 1, 2, 3 and 4 steps ahead, using the last available observations



# 6 Conclusions

In the present paper we apply the GDFM to produce nowcasts and short-term forecasts of real Bulgarian GDP from large data set. A method for selection of model specification and a dataset based on the pseudo out-of-sample performance of the model is proposed. The selected subsets for the different forecast horizons still contain variables from all economic sectors and the forecast remains based on a very wide range of information.

Also a simple method, which exploits the dynamic properties of the GDFM, is used for including the latest available observations of series with smaller publication delay. The results show improvement of the chosen measure of the model performance and we can conclude that our methodology successfully exploits information in the recent observations of the series. Thanks to both data subset selection and the inclusion of the latest available information, a reduction of up to 50 per cent of the root mean squared error of the forecasts is obtained.

The specifics of the Bulgarian economy and in particular the short time span of the dataset have a negative impact on the stability of the model specification and variable selection over time. However, there is a scope for a further examination of the properties and the results of the model over time. The transformation of the data series also is a potential area for improvement of the results, although the initial examination of some of the alternatives does not give encouraging results.

# 7 Appendix A: Technical Details

Our estimation starts with computation of the sample covariance matrix $\Gamma_{nk}^T$ of $X_n^T$ and $X_{n-k}^T$, for $k = 0, 1, \ldots, M$. We use it to estimate the spectral-density matrix of $X_n^T$ *via* discrete Fourier transformation of the two-sided sequence $\Gamma_{n,-M}^T, \ldots, \Gamma_{n,0}^T, \ldots, \Gamma_{n,M}^T$, where $\Gamma_{n,-k}^T = \Gamma_{n,k}^{T\prime}$. Precisely,

$$\Sigma_n^T(\theta_h) = \frac{1}{2\pi} \sum_{k=-M}^{M} \Gamma_{nk}^T w_k e^{-ik\theta_h},$$

where the frequencies are equally spaced in the interval $[0, 2\pi]$, *i.e.* $\theta_h = \frac{2\pi h}{2M+1}$, $h = 0, \ldots, 2M$, and $w_k = 1 - \frac{|k|}{M+1}$, $k = -M, \ldots, M$ are the weights corresponding to the Bartlett lag window of size $M$. We choose $M = 6$, which is close to the proposed in Forni *et al.* (2002) value of $[T^{1/3}] + 1$.

Further we perform the dynamic principal decomposition. For each frequency of the grid (*i.e.* for $h = 0, 1, \ldots, 2M$) we compute the eigenvalues $\lambda_{nj}^T(\theta_h)$ and their associated eigenvectors $\mathbf{p}_{nj}^T(\theta_h)$, $j = 1, \ldots, n$ of $\Sigma_n^T(\theta_h)$, where $\lambda_{nj}^T(\theta_h)$ are sorted in decreasing order, *i.e.* $\lambda_{n1}^T(\theta_h) \geq \ldots \geq \lambda_{nn}^T(\theta_h)$. We put $\mathbf{P}_n^T(\theta_h) = (\mathbf{p}_{n1}^{T\prime}(\theta_h), \ldots \mathbf{p}_{nq}^{T\prime}(\theta_h))'$ and $\mathbf{Q}_n^T(\theta_h) = (\mathbf{p}_{n,q+1}^{T\prime}(\theta_h), \ldots \mathbf{p}_{nn}^{T\prime}(\theta_h))'$. The spectral-density matrices of the common and idiosyncratic components are defined as

$$\Sigma_n^{\chi T}(\theta_h) = \tilde{\mathbf{P}}_n^T(\theta_h) \left\{ \begin{array}{ccc} \lambda_{n1}^T(\theta_h) & & \mathbf{0} \\ & \ddots & \\ \mathbf{0} & & \lambda_{nq}^T(\theta_h) \end{array} \right\} \mathbf{P}_n^T(\theta_h)$$

and

$$\Sigma_n^{\xi T}(\theta_h) = \tilde{\mathbf{Q}}_n^T(\theta_h) \left\{ \begin{array}{ccc} \lambda_{n,q+1}^T(\theta_h) & & \mathbf{0} \\ & \ddots & \\ \mathbf{0} & & \lambda_{nn}^T(\theta_h) \end{array} \right\} \mathbf{Q}_n^T(\theta_h),$$

where the tilde denotes complex conjugation and transposition. We obtain the covariance matrices $\Gamma_{nk}^{\chi T}$ and $\Gamma_{nk}^{\xi T}$ of the common and idiosyncratic components *via* the inverse discrete Fourier transformation:

$$\Gamma_{nk}^{\chi T} = \frac{2\pi}{2M+1} \sum_{h=-M}^{M} \Sigma_n^{\chi T}(\theta_h) e^{i\theta_h k}$$

$$\Gamma_{nk}^{\xi T} = \frac{2\pi}{2M+1} \sum_{h=-M}^{M} \Sigma_n^{\xi T}(\theta_h) e^{i\theta_h k}$$

The aggregates which we use to approximate the common-factor space are of the form $W_{nt}^{kT} = Z_{nk}^T X_n^t$, where the weights $Z_{nk}^T$ are defined as the solution, for $1 \leq k \leq r$ of the generalized eigenvalue problem

$$\begin{array}{lll} Z_{nk}^T & = & Arg\ max\ \mathbf{a}\Gamma_{n0}^{\chi T}\tilde{\mathbf{a}} \\ \text{s.t.} & & \mathbf{a}\Gamma_{n0}^{\xi T}\tilde{\mathbf{a}} = 1 \\ & & \mathbf{a}\Gamma_{n0}^{\chi T}\tilde{Z}_{nm}^T = 0 \qquad \text{for } 1 \leq m \leq k, 1 \leq k \leq n \end{array}$$

Thus the vectors $Z_{nj}^T$, $j = 1, \ldots, n$ are the generalized eigenvectors, associated with the generalized eigenvalues $\eta_{nj}^T$ of the couple of matrices $(\Gamma_{n0}^{\chi T}, \Gamma_{n0}^{\xi T})$.

Our estimate for $\chi_{i,T+h}$ is

$$\chi_{i,T+h}^{nT} = \left(\Gamma_{nh}^{\chi T} Z_n^T (\tilde{Z}_n^T \Gamma_{n0}^T Z_n^T)^{-1} \tilde{Z}_n^T X_n^T\right)_i,$$

where $Z_n^T = (Z_{n1}^{T\prime}, \ldots, Z_{nr}^{T\prime})'$.

Analogously,

$$\chi_{it}^{nT} = \left(\Gamma_{n0}^{\chi T} Z_n^T (\tilde{Z}_n^T \Gamma_{n0}^T Z_n^T)^{-1} \tilde{Z}_n^T X_n^t\right)_i, \qquad \text{for } t \leq T$$

is our estimate of the common components $\chi_{it}$.

The model is implemented in Matlab on the basis of codes published by M. Forni

(http://www.economia.unimore.it/forni_mario/matlab.h

# 8 Appendix B: Data List

| | Variables | Transf. | Variables used for $h$ steps ahead prediction | | | |
|---|---|---|---|---|---|---|
| | | | $h=1$ | $h=2$ | $h=3$ | $h=4$ |
| | Quarterly data | | | | | |
| 1 | Gross domestic product, value at constant prices | 2 | + | + | + | + |
| 2 | Gross domestic product, value at current prices | 2 | - | + | + | + |
| 3 | Consumer survey - financial situation relative to 12 months ago | 1 | - | + | - | + |
| 4 | Consumer survey - financial situation over the next 12 months | 1 | - | + | - | + |
| 5 | Consumer survey - general economic situation over the last 12 months | 1 | + | + | - | + |
| 6 | Consumer survey - general economic situation over the next 12 months | 1 | - | + | - | + |
| 7 | Consumer survey - consumer price developments over the last 12 months | 1 | - | + | - | + |
| 8 | Consumer survey - inflation expectations over the next 12 months | 1 | - | + | - | - |
| 9 | Consumer survey - unemployment expectations over the next 12 months | 1 | - | + | - | + |
| 10 | Consumer survey - preference for making major purchases (for durable goods, etc.) - assessment of the present situation | 1 | - | + | + | + |
| 11 | Consumer survey - expectations for making major purchases (for durable goods, etc.) over the next 12 months | 1 | - | + | - | + |
| 12 | Consumer survey - possibility to save at present | 1 | - | + | - | - |
| 13 | Consumer survey - expectations for saving over the next 12 months | 1 | - | + | + | + |
| 14 | Consumer survey - current financial situation of the household | 1 | - | + | + | + |
| 15 | Consumer survey - expectations for car purchases over the next 2 years | 1 | - | + | + | + |

| | Variables | Transf. | $h=1$ | $h=2$ | $h=3$ | $h=4$ |
|---|---|---|---|---|---|---|
| 16 | Consumer survey - expectations for house purchases over the next 2 years | 1 | - | + | - | + |
| 17 | Consumer survey - expectations for purchases related to home improvements over the next 12 months | 1 | - | + | - | - |
| 18 | Consumer survey - confidence indicator | 1 | - | + | - | + |
| 19 | LFS-employment | 2 | + | + | + | + |
| 20 | LFS-unemployed | 1 | - | + | - | + |
| 21 | Labour productivity | 2 | + | + | - | - |
| 22 | Unit labour cost, nominal | 2 | - | + | - | + |
| 23 | Final individual consumption, value at current prices | 2 | - | + | + | - |
| 24 | Final collective consumption, value at current prices | 2 | - | + | - | - |
| 25 | Exports of goods and services, value at current prices | 2 | - | + | + | + |
| 26 | Imports of goods and services, value at current prices | 2 | + | + | - | - |
| 27 | Gross fixed capital formation, value at current prices | 2 | + | + | + | - |
| 28 | Change in inventories, value at current prices | 1 | - | - | - | - |
| 29 | Final individual consumption, value at constant prices | 2 | - | + | - | - |
| 30 | Final collective consumption, value at constant prices | 2 | - | + | - | - |
| 31 | Exports of goods and services, value at constant prices | 2 | - | + | + | - |
| 32 | Imports of goods and services, value at constant prices | 2 | - | + | - | - |
| 33 | Gross fixed capital formation, value at constant prices | 2 | - | + | - | - |
| 34 | Change in inventories, value at constant prices | 1 | - | - | + | - |
| 35 | Exports of goods, EUR | 2 | - | + | + | - |
| 36 | Imports of goods, EUR | 2 | - | + | - | - |
| 37 | Exports of services, EUR | 2 | - | + | + | - |
| 38 | Imports of services, EUR | 1 | - | + | - | + |
| 39 | Current account, EUR | 2 | - | + | - | - |
| 40 | Net inflow of FDI | 1 | - | + | + | - |
| 41 | Government Expenditures, cash basis | 1 | - | + | - | - |
| 42 | Government Revenue, cash basis | 1 | + | + | - | + |
| 43 | Value added tax, cash basis | 1 | - | + | + | + |

| | Variables | Transf. | $h=1$ | $h=2$ | $h=3$ | $h=4$ |
|---|---|---|---|---|---|---|
| 44 | Capital expenditure, cash basis | 1 | - | + | - | - |
| 45 | BNB official reserves | 1 | - | + | + | - |
| | Monthly data | | | | | |
| 46 | Unemployment rate (%) | 2 | - | + | + | + |
| 47 | Job vacancies over the last month | 1 | - | + | + | + |
| 48 | Share of long-term unemployed in the total number of unemployed | 1 | - | + | + | + |
| 49 | Business climate in the euro zone | 1 | - | + | - | + |
| 50 | Index of Fuel and Non Fuel Commodities (1995=100) | 1 | - | + | + | - |
| 51 | Index of Non-Fuel Primary Commodities (1995=100) | 2 | + | + | - | + |
| 52 | Edibles Index (1995=100) | 1 | + | + | + | + |
| 53 | Food Index: Cereals, vegetable oils, protein meals, meats, seafood, sugar, bananas and oranges | 1 | - | + | + | + |
| 54 | Index of Beverages, Coffee, Cocoa, and Tea | 1 | - | + | + | + |
| 55 | Index of Industrial Inputs (1995=100) | 1 | - | + | + | + |
| 56 | Index of Agricultural Raw Materials (1995=100) | 1 | - | + | + | - |
| 57 | Metals index | 1 | - | + | + | + |
| 58 | Commodity Fuel (energy) Index, 2005=100, includes Crude oil (petroleum), Natural Gas, and Coal Price Indices | 1 | - | + | + | - |
| 59 | Average Petroleum Spot index of UK Brent, Dubai, amd West Texas | 1 | - | + | + | - |
| 60 | Turnover Indices in 'Wholesale and retail trade; repair of motor vehicles and motorcycles'r | 1 | - | + | - | - |
| 61 | Turnover Indices in 'Wholesale and retail trade and repair of motor vehicles and motorcycles' | 1 | + | + | + | + |
| 62 | Turnover Indices in 'Wholesale trade, except of motor vehicles and motorcycles'r | 1 | - | + | + | + |
| 63 | Turnover Indices in 'Retail trade, except of motor vehicles and motorcycles'r | 1 | - | + | - | - |
| 64 | Industrial Production Indices | 2 | + | + | + | + |
| 65 | Production Indices in 'Mining and quarrying' | 1 | - | + | - | - |
| 66 | Production Indices in 'Manufacturing' | 2 | + | + | - | + |

| | Variables | Transf. | $h=1$ | $h=2$ | $h=3$ | $h=4$ |
|---|---|---|---|---|---|---|
| 67 | Production Indices in 'Electricity, gas, steam and air conditioning supply' | 2 | + | + | - | - |
| 68 | Industrial Turnover Indices | 2 | - | + | + | + |
| 69 | Turnover Indices in 'Mining and quarrying' | 1 | - | + | - | - |
| 70 | Turnover Indices in 'Manufacturing' | 2 | - | + | + | - |
| 71 | Turnover Indices in 'Electricity, gas, steam and air conditioning supply' | 2 | + | + | + | + |
| 72 | Construction survey - current business situation | 1 | + | + | - | + |
| 73 | Construction survey - current situation of production activity | 1 | + | + | - | + |
| 74 | Construction survey - order-books level, total | 1 | - | + | + | + |
| 75 | Construction survey - orders received over the last month compared to the previous month, total | 1 | - | + | + | + |
| 76 | Construction survey - orders received over the last month compared to the previous month, civil engineering | 1 | - | + | - | + |
| 77 | Construction survey - orders received over the last month compared to the previous month, building construction | 1 | - | + | + | - |
| 78 | Construction survey - number of clients with delayed payments, total | 1 | - | + | + | + |
| 79 | Construction survey - expected business situation over the next 6 months | 2 | - | + | + | + |
| 80 | Construction survey - Future production tendency | 2 | - | + | + | + |
| 81 | Construction survey - Selling price expectations | 1 | - | + | + | + |
| 82 | Construction survey - employment expectations | 1 | - | + | - | + |
| 83 | Construction survey - composite business climate | 2 | - | + | + | + |
| 84 | Industry survey - present business situation | 1 | - | + | + | + |
| 85 | Industry survey - present production tendency | 1 | - | + | - | - |
| 86 | Industry survey - order-books level - total | 2 | - | + | - | - |
| 87 | Industry survey - order-books level - dometic | 2 | - | + | - | - |
| 88 | Industry survey - order-books level - export | 1 | + | + | - | - |

| | Variables | Transf. | $h=1$ | $h=2$ | $h=3$ | $h=4$ |
|---|---|---|---|---|---|---|
| 89 | Industry survey - stocks of finished goods | 1 | - | + | - | - |
| 90 | Industry survey - future business situation | 1 | - | + | - | + |
| 91 | Industry survey - future production tendency | 1 | - | + | - | - |
| 92 | Industry survey - price expectations | 1 | - | + | - | - |
| 93 | Industry survey - price increase | 1 | - | + | - | + |
| 94 | Industry survey - composite business climate | 1 | - | + | + | + |
| 95 | Industry survey - composite confidence indicator | 1 | - | + | - | + |
| 96 | Industry survey - insufficient domestic demand | 2 | + | + | - | - |
| 97 | Industry survey - insufficient foreign demand | 1 | - | + | - | - |
| 98 | Industry survey - competitive imports | 1 | - | + | - | + |
| 99 | Industry survey - shortage of labour, including skilled | 1 | - | + | + | + |
| 100 | Industry survey - lack of appropriate equipment | 1 | - | + | + | - |
| 101 | Industry survey - shortage of energy | 2 | - | + | + | + |
| 102 | Industry survey - finacial problems | 2 | - | + | + | + |
| 103 | Industry survey - unclear economic laws | 1 | - | + | - | - |
| 104 | Industry survey - uncertainty of the economic environment | 1 | - | + | - | + |
| 105 | Industry survey - others constraints | 1 | - | + | + | - |
| 106 | Industry survey - no constraints | 1 | - | + | + | + |
| 107 | Retail trade survey - current business situation | 1 | - | + | - | - |
| 108 | Retail trade survey - current situation of the competitive pressures in the sector | 1 | - | + | + | + |
| 109 | Retail trade survey - current situation of the volume of stock of finished goods | 1 | - | + | + | + |
| 110 | Retail trade survey - current situation of selling prices | 1 | + | + | + | + |
| 111 | Retail trade survey - current increase of selling prices | 1 | + | + | + | - |
| 112 | Retail trade survey - expected business situation over the next 6 months | 1 | - | + | - | + |
| 113 | Retail trade survey - expected volume of orders to suppliers, total | 1 | - | + | - | + |

| | Variables | Transf. | $h=1$ | $h=2$ | $h=3$ | $h=4$ |
|---|---|---|---|---|---|---|
| 114 | Retail trade survey - expected volume of orders to domestic suppliers | 1 | - | + | - | + |
| 115 | Retail trade survey - expected volume of orders to suppliers abroad | 1 | - | + | - | + |
| 116 | Retail trade survey - sales expectations over the next 3 months | 1 | - | + | - | + |
| 117 | Retail trade survey - selling price expectations over the next 3 months | 1 | + | + | - | + |
| 118 | Retail trade survey - selling price increase over the next 3 months | 1 | + | + | - | + |
| 119 | Retail trade survey - employment expectations | 1 | - | + | - | + |
| 120 | Retail trade survey - demand constraints | 1 | - | + | - | + |
| 121 | Retail trade survey - supply constraints | 1 | + | + | + | - |
| 122 | Retail trade survey - constraints related to competition | 1 | + | + | + | + |
| 123 | Retail trade survey - constraints related to uncertainty | 1 | - | + | + | - |
| 124 | Retail trade survey - constraints related to the work-force | 1 | - | + | + | + |
| 125 | Retail trade survey - other constraints | 1 | + | + | + | + |
| 126 | Retail trade survey - no constraints | 2 | - | + | + | + |
| 127 | Total income of households - in pecuniary form | 2 | - | + | - | + |
| 128 | Total income of households - total | 2 | - | + | - | + |
| 129 | Total expenditures of households - in pecuniary form | 2 | - | + | - | + |
| 130 | Total expenditures of households - total | 2 | + | + | - | + |
| 131 | Headline CPI | 1 | - | + | - | + |
| 132 | Headline HICP | 1 | - | + | - | + |
| 133 | Employees | 2 | + | + | + | + |
| 134 | Wages | 1 | + | + | - | - |
| 135 | Claims on non-government sector | 1 | + | + | - | + |
| 136 | Monetary aggregate M3 | 1 | - | + | - | - |
| 137 | Monetary aggregate M1 | 1 | + | + | - | - |
| 138 | Currency outside MFIs | 2 | + | + | - | + |
| 139 | Monetary aggregate M2 (M1+Quasi-money) | 1 | - | + | - | - |
| 140 | Interest rate on the inter-bank money market, BGN | 2 | - | + | - | + |

Transformation code:

1 $x_{it} = (1-L)X_{it}$

2 $x_{it} = (1-L)(1-L^4)X_{it}$

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# Survey Evidence on Price-setting Behaviour of Firms in Bulgaria

Zornitsa Vladova

**Abstract.** This paper presents the key features of the price-setting behavior of Bulgarian firms based on a representative survey on wage and price formation in non-financial enterprises from the manufacturing, trade and services sectors conducted in 2009. The survey incorporates the questionnaire of the Wage Dynamics Network project of the Eurosystem and is also supplemented with additional questions from the earlier Inflation Persistence Network research project. The descriptive evidence from the survey presented in this paper lends support to some of the regularities and stylized facts from the Inflation Persistence Network project. The main results with respect to price-setting patterns, time dependence of price changes and reported speed of price adjustments to positive and negative shocks to costs and demand suggest that prices in Bulgaria can be characterized as flexible. A key finding of the survey is that the wage – price link in Bulgaria is relatively weak compared to the average for the EU countries. The survey also provides evidence that the most important factor driving price increases at firm level is intermediate input costs.

**Резюме.** Статията представя основните характеристики на начина на ценообразуване на българските предприятия на базата на представително анкетно проучване на механизмите за определяне на заплатите и цените в нефинансовите предприятия от преработващата промишленост, търговията и услугите, проведено през 2009 г. Проучването включва въпросника от проекта на Евросистемата Мрежа за изследване на динамиката на работните заплати (Wage Dynamics Network) и е разширено с допълнителни въпроси от по-ранния изследователски проект Мрежа за изследване устойчивостта на инфлацията (Inflation Persistence Network). Описателните резултати от проучването, представени в този материал, подкрепят някои от установените резултати и стилизирани факти от проекта Мрежа за изследване устойчивостта на инфлацията. Основните резултати, свързани с начина на ценообразуване, времевата зависимост на промените в цените и отчетената бързина на реакция на цените спрямо благоприятни и неблагоприятни шокове върху разходите и търсенето, показват, че цените в България могат да бъдат определени като гъвкави. Един от важните резултати от проучването е, че връзката между заплатите и цените в България е сравнително слаба в сравнение със средното ниво за държавите от ЕС. Данните от анкетното проучване също показват, че най-важният фактор за повишение на цените на фирмено равнище са разходите за междинно потребление.

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## Contents

## Introduction

This paper documents the main characteristic features of the price-setting practices in Bulgarian firms based on a survey that was conducted in 2009 within the Wage Dynamics Network (WDN) project framework of the Eurosystem. The survey applied the harmonized questionnaire of that network and was further extended with questions from the survey part of the earlier Inflation Persistence Network (IPN) research project with a view to exploring in a greater detail the pricing behaviour of Bulgarian firms. The survey has enabled collection of valuable empirical evidence at firm level on wage- and price-setting behaviour in Bulgaria. Information on the latter has generally been rather limited to date and can serve to enrich the macroeconomic level of analysis of wage and price dynamics in the country.

The survey sample comprises 504 enterprises (that employ a total of 19 463 people) from 3 sectors: manufacturing, trade and market services (excluding public and financial services). Targeted firms were limited to those that have at least 5 employees. The survey results are representative for the three sectors.

This paper documents and analyses the key features of the price-setting practices of Bulgarian firms and attempts to draw preliminary conclusions on the relevance of these practices for the overall flexibility of the Bulgarian economy. The paper also addresses one of the main research questions of the WDN project, namely the relationship between wages and prices. This was motivated initially by the findings of the IPN project that suggested that wage stickiness could play an important role in the slow adjustment of prices. Furthermore, the results on the pricing strategies of Bulgarian firms are discussed in the context of consumer price developments in the country over the last years. Additionally, the key findings for Bulgaria are compared with those for EU countries based on the WDN project results as well as with the summary of the IPN survey evidence for nine euro area countries.

The presented comparison of results shows that several of the regularities and stylized facts with respect to firm-level price-setting behaviour found by the Eurosystem's WDN project and the survey part of the IPN project can be traced in the Bulgarian data as well. This happens despite the fact that the survey in Bulgaria was conducted in the period September–October 2009, while the national surveys within the WDN and IPN projects took place under different macroeconomic conditions (the IPN project was carried out in the period 2003 – 2004 and the main part of the WDN project was conducted in the period 2007 – 2008). The year 2009 was the first year of negative economic growth for Bulgaria since 1997. The global economic and financial crisis represented a significant external shock to the economy

following a period of steadily growing capital inflows, accelerating economic activity and development of optimistic expectations of economic agents. Against this background, the sharp deterioration in economic conditions since September 2008 reflected in a significant reduction in industrial export sales was followed by increasing uncertainty in all economic sectors and a radical change in the behaviour of agents. Specifically, the reaction of companies involved cost-cutting strategies, while households increased their saving rate. Despite the significant change in the behaviour of economic agents in Bulgaria, the 2009 survey evidence of common characteristics of firms' price-setting practices with those discovered in the Eurosystem is suggestive that some of these features are generally of a more structural nature or have sector-specific rather than cross-country or cyclical pattern, and therefore have certain stability over time.

The paper is structured as follows. Section 2 describes the survey design, providing information on the questionnaire used, the sample of the survey and the implementation of the survey itself. Section 3 describes the main characteristics of the market environment of the firms in the sample, seeking to identify the market conditions for the price-setting practices of firms. Section 4 presents the main results on the price-setting practices of Bulgarian firms, focusing on pricing strategies, reasons for upward/downward price changes, flexibility of prices and the wage – price link. Section 5 summarizes the main conclusions.

## The survey design

### *The survey questionnaire*

The main source of the survey design was the harmonized questionnaire applied within the WDN project framework of the Eurosystem. The questionnaire comprises five main parts (see the whole questionnaire in the Appendix). The first part investigates firms' wage-setting practices. The second part explores the issue of downward wage rigidity. The third part collects information on the reactions of firms to unanticipated significant negative shocks (slowdown in demand, increase in the costs of intermediate inputs and permanent increase in wages). In view of the importance of assessing firms' reaction to positive shocks (e.g. "increase in demand" that is considered relevant from the point of view of the catching-up of the Bulgarian economy and "decrease in the costs of intermediate inputs" that became relevant with the beginning of the global financial and economic crisis in 2008), such questions were also added to the third section of the questionnaire. The fourth section, which provides the core data set for the analysis in this paper,

seeks to investigate in more detail the price-setting behaviour of firms and the frequency of price changes. The final section of the questionnaire examines some firm-level characteristics (e.g. the number of employees, workforce turnover, age and tenure characteristics of the employees and the share of labour costs in total costs).

With a view to deepening the understanding of the price-setting behaviour of Bulgarian firms, the design of the survey additionally drew on the broadly comparable questionnaires applied within the framework of the earlier euro area wide IPN project. In particular, the Bulgarian survey included questions on the importance of various factors for price increases/decreases, on possible reasons for price stickiness, as well as questions on the speed of price adjustments after positive and negative shocks to costs and demand. Another question that was included was whether firms take into consideration the pricing policy of sectoral/branch organizations in case they are members of such organizations. That question aimed to shed further light on the price-setting practices of firms.

In the design of the Bulgarian survey it was also considered adequate to include additional questions that were part of the follow-up WDN survey carried out in the summer of 2009 after the original WDN survey from the 2007 – 2008 period. The aim of the follow-up survey was to explore the key mechanisms underlying firms' adjustment practices during the economic and financial downturn. To address the same research question, the Bulgarian questionnaire was supplemented with a section on the effects of the crisis on firms' activities. Furthermore, in the original sections on downward wage rigidities and reaction to shocks it was underlined that when answering the questions respondents could draw on their experience during the time of the economic crisis.

A relatively small part of the questions in the questionnaire requires quantitative information. The predominant part of the questionnaire requires qualitative answers, either in the form of a specific choice among a number of alternatives or in the form of determining the extent of importance of different factors for firms' decisions and reactions. For the questions related to prices in the sections dealing with reactions to shocks and price setting and price changes, firms are asked to refer to their "main product or service", defined as the one that generated the highest fraction of their revenue/turnover in 2008. For their main market, firms had to refer to the market that generated the highest fraction of revenues from sales of their main product or service in 2008.

In a large of number of questions firms are asked to refer to their "normal conditions and practices" as in the original WDN questionnaire. Although

it was recognized that such specification could be difficult to abide by in a time when firms are experiencing effects of an economic crisis, it was decided to keep that formulation with the objective of staying as close as possible to the original questionnaire applied by the other countries. The reference period for a few of the questions that required a specific year in the original survey (e.g. the size and distribution of the workforce, the share of labour costs, etc.) was set to 2008, that is the last full year for which such data could be available at firm level at the time of conducting the survey. Due to the complex nature of the required information, the survey was intended for representatives of the senior management of firms.

### *The sample and the implementation of the survey*

The survey was conducted in the period September–October 2009 by an external private company. The implementation of the survey was based on a representative sample of 3 broad economic sectors: manufacturing, trade and market services. The choice was motivated by the objective of exploring firm-level wage and price-setting behaviour in sectors where this behaviour is predominantly market-based rather than determined by decisions of administrative and regulatory bodies (e.g. the decision on the price of electricity for households and small firms that is set by the State Commission for Energy and Water Regulation). The design of the survey covered firms with 20 or more employees in the manufacturing sector and firms with at least five persons in trade and business services sectors. The following sectors of the statistical classification of economic activities (NACE rev.2) were targeted:

1. manufacturing (sector C);

2. trade (sector G: Wholesale and retail trade; Repair of motor vehicles and motor cycles)

3. services:

a. sectors H-J: Transportation and storage; Accommodation and food service activities; Information and communication

b. sectors L-N: Real estate activities; Professional, scientific and technical activities; Administrative and support service activities

c. sector R93.2: Activities related to recreation and entertainment

d. sectors S95-96: Repair of computers, personal and household items; Other personal services.

The survey was carried out mainly in the form of face-to-face interviews; a supplementary approach was email and traditional mail.

The characteristics of the total population of firms in the three broad sectors specified above were drawn from NSI data as of end-2007. The com-

position of the total population of firms (by sector and firm size given by the number of employees) is presented below.

Table 1

**TOTAL POPULATION: NUMBER OF FIRMS BY SECTOR AND FIRM SIZE**

| | Number of employees | | | | |
|---|---|---|---|---|---|
| Sector | 5-19 | 20-49 | 50-249 | 250+ | Total |
| Manufacturing | - | 3076 | 2192 | 379 | 5647 |
| Trade | 11743 | 2349 | 758 | 57 | 14907 |
| Services | 9991 | 2073 | 940 | 161 | 13165 |
| Total | 21734 | 7498 | 3890 | 597 | 33719 |

Table 2

**TOTAL POPULATION: PER CENT OF FIRMS BY SECTOR AND FIRM SIZE**

| | Number of employees | | | | |
|---|---|---|---|---|---|
| Sector | 5-19 | 20-49 | 50-249 | 250+ | Total |
| Manufacturing | - | 9.1 | 6.5 | 1.1 | 16.7 |
| Trade | 34.8 | 7.0 | 2.2 | 0.2 | 44.2 |
| Services | 29.6 | 6.1 | 2.8 | 0.5 | 39.0 |
| Total | 64.5 | 22.2 | 11.5 | 1.8 | 100.0 |

The characteristics of the realized sample of 504 enterprises (targeted sample of 500) follow those of the total population of firms (i.e. a proportional representation of the population of firms under study is ensured), with a slight over-representation of the manufacturing sector. The sample in the survey comprises 97 manufacturing firms, 221 trade firms and 186 firms with operational activities in the business services sector. In terms of firm size, small companies (with less than 20 employees) predominate in the sample, accounting for nearly 60% of all firms. The total number of employees covered in the sample is 19 463, with around 40% of them in the manufacturing and another 40% in the trade sector. In the analysis presented in this paper the results are employment-weighted (employment in the firm relative to the total number of employees in the sample) so as to ensure that a higher weight is given to the replies of larger firms as their decisions on wage and price setting are more important for the economy.[1]

[1] Employment-weighted results are also reported for the countries that participated in the WDN survey which allows comparison of results.

Table 3

**REALIZED SAMPLE: NUMBER OF FIRMS BY SECTOR AND FIRM SIZE**

| | Number of employees | | | | |
|---|---|---|---|---|---|
| Sector | 5-19 | 20-49 | 50-249 | 250+ | Total |
| Manufacturing | 2 | 53 | 35 | 7 | 97 |
| Trade | 158 | 37 | 23 | 3 | 221 |
| Services | 139 | 28 | 19 | 0 | 186 |
| Total | 299 | 118 | 77 | 10 | 504 |

Table 4

**REALIZED SAMPLE: PER CENT OF FIRMS BY SECTOR AND FIRM SIZE**

| | Number of employees | | | | |
|---|---|---|---|---|---|
| Sector | 5-19 | 20-49 | 50-249 | 250+ | Total |
| Manufacturing | 0.4 | 10.5 | 6.9 | 1.4 | 19.2 |
| Trade | 31.3 | 7.3 | 4.6 | 0.6 | 43.8 |
| Services | 27.6 | 5.6 | 3.8 | 0.0 | 36.9 |
| Total | 59.3 | 23.4 | 15.3 | 2.0 | 100.0 |

## Market environment for the firms in the sample

Price formation in the three broad economic sectors examined in the survey is first set in the context of the market environment for each of the sectors, considering the fact the price setting depends to a large extent on the specific market environment for firms. The analysis of market conditions is done by discussing the features of the main market for surveyed firms (domestic vs. foreign), the extent of competitive pressures faced by firms, the importance of long-term contracts with clients and the orientation of sales (to other firms vs. to final consumers). Then the respective market structure characteristics for the surveyed firms within the IPN project, one of the two main references for the results for EU countries, are outlined. The IPN survey evidence, which comprises results for nine euro area countries, can be used for comparison of the results from the Bulgarian survey on pricing strategies and reasons for price changes. The IPN provides results on pricing strategies and reasons for price changes at both euro area aggregate level and euro area country level.[2] The WDN results, which have a greater coverage than the survey IPN results as they cover most euro area countries and non-euro

[2] The IPN evidence covers nine euro area countries – Austria, Belgium, France, Germany, Italy, Luxemburg, the Netherlands, Portugal and Spain – and is based on price-setting surveys conducted in 2003 and 2004.

area EU countries, can be taken as reference for the questions on the frequency of price changes, the time dependence of wage and price changes and the link between wages and prices. The summary of the WDN evidence presented by Druant (2009) provides data on the frequency of price changes both across EU countries and on aggregate for the euro area and non-euro area countries. This evidence also covers data on the time dependence of price changes on aggregate for the euro area and non-euro area countries. In addition, the Final Report of the WDN (ECB, 2010) provides country-level evidence on the policies of adjusting base wages to inflation that can be used for comparison with the results for Bulgaria.

For nearly 80% of the companies in the sample the largest part of their revenues in 2008 is obtained from the domestic market.[3] For about 50% of manufacturing companies the main market for their products is the external market, whereas in the trade and services sectors foreign markets are the main market for only 1% and 8% of surveyed firms respectively.

The extent of competitive pressures is assessed by two questions in the survey. In the first one the companies are asked to determine the strength of price competition they face for their main product/service, choosing among the following five options: "severe", "strong", "weak", "no competition" and "don't know". The second question examines how likely it is for firms to decrease the price of their main product/service if their main competitor decreases its own prices, with the possible answers being "very likely", "likely", "not likely", "not at all" and "doesn't apply". According to the first question, 83% of companies regard their competition as high (the number is estimated as the share of firms answering with either "severe" or "strong"), with the trade sector stating to experience the highest competition (92% of all firms in that sector give such an answer). Only a small number of all companies (10%) consider the competition on their main market as low or very low. Based on the second question, 69% of companies are likely to follow the reduction of prices initiated by their competitor. The trade sector perceives the strongest competitive pressures (80% of companies answer with "very likely" or "likely").

The IPN survey project identifies long-term relationships with clients as one of the key factors underlying price-stickiness in the euro area countries. In the Bulgarian survey 35% of the firms have more than 60% of their total revenues coming from sales to partners with whom contracts are defined as long-term. The latter are most prevalent in the manufacturing sector (for half

[3] It is assumed that the main market for companies is the one where they obtain more than 60% of their total revenues in 2008.

of the companies) and least important in terms of share in total revenues in the trade sector (only one fourth of companies in the trade sector report that the predominant part of their revenues is generated from long-term contracts with clients). It should be noted that one third of the firms in the sample did not provide an answer about the importance of long-term contracts.

As regards the customer orientation of firms' sales, around 40% of the surveyed firms deal primarily with other firms (nearly 50% of manufacturing firms and slightly more than one third of trade and business services companies).[4] Only 5% of all firms report final consumers as their main customers. Even in the services sector, only 15% of firms sell mainly to final consumers.

In the IPN survey evidence the sectoral coverage is mostly concentrated on the industrial sector (Fabiani et al., 2005). This implies that when making comparisons on these issues between results for Bulgarian firms and euro area companies, we need to consider predominantly the manufacturing sector. The main market for the surveyed euro area firms in the IPN was the domestic one (for 73% of the companies) which is also largely the case for the firms in the Bulgarian survey, with the slight difference that surveyed firms in the manufacturing sector in Bulgaria report almost equally distributed main revenues generated from the domestic and from foreign markets. The IPN survey results show that firm-customer relationships are determined as long-term by 70% of firms on average for the euro area which is relatively close to the results from the Bulgarian survey, with 50% of firms in the manufacturing sector working predominantly with long-term contracts. Around 60% of the companies that participated in the IPN viewed their competition as high or very high. This is broadly comparable to the 75% of firms in the industry sector in the Bulgarian survey that stated that the market they operate on has high or very high competition.

Overall, the broad similarity of the market environment conditions for the surveyed euro area firms in the IPN (largely from the industry sector) and the market environment for the firms in the industry sector in the Bulgarian survey seems to point to common sectoral characteristics. Nevertheless, differences in overall macroeconomic conditions may be a potential factor affecting the results for pricing strategies applied by both euro area and Bulgarian firms.

[4] We use the same assumption for characterizing "main customer" as in the case of the main market as defined above.

## Price-setting behaviour of firms

This section presents the results on the main features of the price-setting behaviour of Bulgarian firms, focusing on pricing strategies, reasons for price changes (price increases and price decreases), flexibility of prices and the link between wages and prices.

### *Pricing strategies*

Firms' price setting rules play an important role in shaping the flexibility of prices in response to shocks to the economy (e.g. related to variation in costs, in demand, etc.) and respectively the adjustment costs of the economy following such shocks. Higher flexibility of prices (as in an environment of perfect competition) lowers the adjustment costs when shocks hit the economy. Furthermore, pricing strategies at firm level provide valuable information that is important for understanding price dynamics in Bulgaria.

As can be seen from the graphs below, the most common price-setting practice among the companies in the three sectors is that of following competitors' prices which may be interpreted as an indication of flexibility of prices in Bulgaria. The relevance of competitors' prices for price setting is reported by 40% of all companies, whereas the second most frequently used pricing rule is that of a mark-up over costs (it was reported by one third of all companies). In general, the predominance of following competitors' prices as a price-setting practice in Bulgaria implies flexibility of prices in the country. A noticeable feature of the results is that about one fourth of firms have no independent pricing policy due to determination of the price by a parent company, price regulation or setting of the price by the main client.

Figure 1

**PRICE SETTING BY SECTOR**

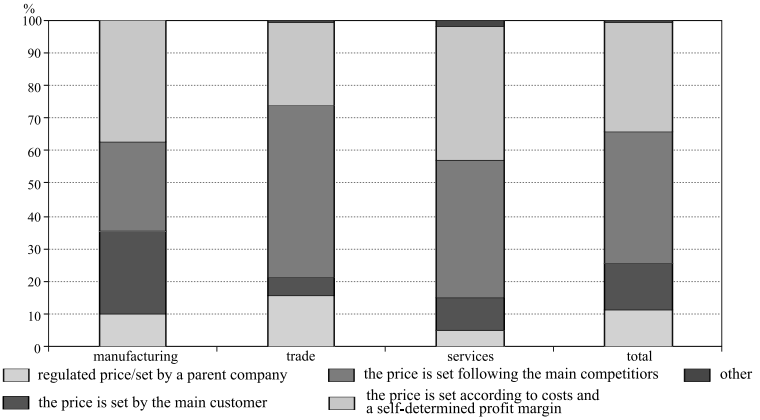
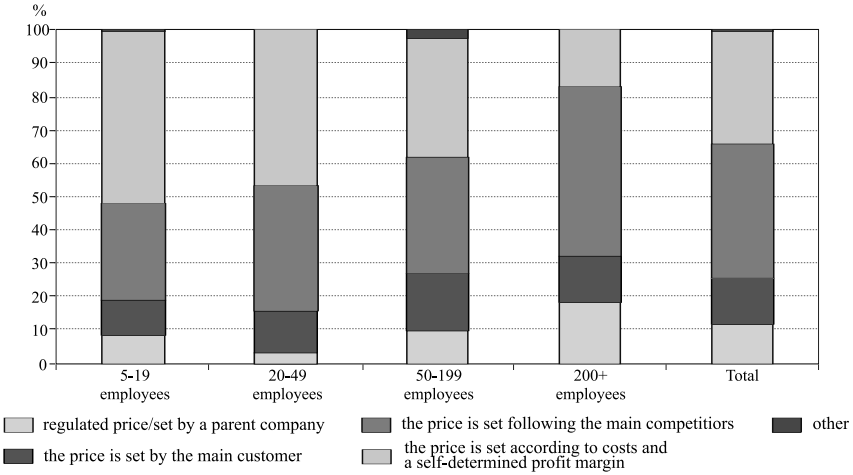


Figure 2

**PRICE SETTING BY FIRM SIZE**




Price-setting policies differ both across sectors and across firm-size groups. In the manufacturing sector 37% of all firms use mark-up pricing, 35% have no autonomy in their price-setting policy and 30% follow competitors' prices. According to the IPN results on price-setting policies, mark-up pricing is the leading pricing strategy in the manufacturing sector in the euro area (applied by 54% of firms), whereas following competitors determines prices of around 30% of companies.

Prices in the trade sector are set mainly considering competitors' prices (53% of all firms in the sector apply this strategy), while in the services sector mark-up and competitors' prices are equally implemented (respectively by 41% and 42% of companies in this sector). The higher prevalence of following competitors' prices in the pricing strategies of Bulgarian firms in the trade sector, respectively the higher flexibility of prices in this sector, could be explained by the fact that trade companies report that they operate in an environment of higher competition relative to the other two sectors.

The survey also shows that larger firms tend to take into consideration competitors' prices relatively more heavily than small ones and that large companies are also more dependent on external price-setters for their prices (e.g. main customer, parent company or government regulatory agency) and consequently apply less frequently mark-up pricing.

The IPN stylized fact that lower competition makes mark-up pricing a more widespread as a practice appears to be confirmed in the Bulgarian

data too. The descriptive analysis of the data reveals that companies facing stronger competition (those that either perceive their competition as high and/or are likely to follow their main competitor's price decline) tend to resort more to following the main competitors in their price-setting practices.

Figure 3

**PRICE SETTING BY PERCEIVED COMPETITION**

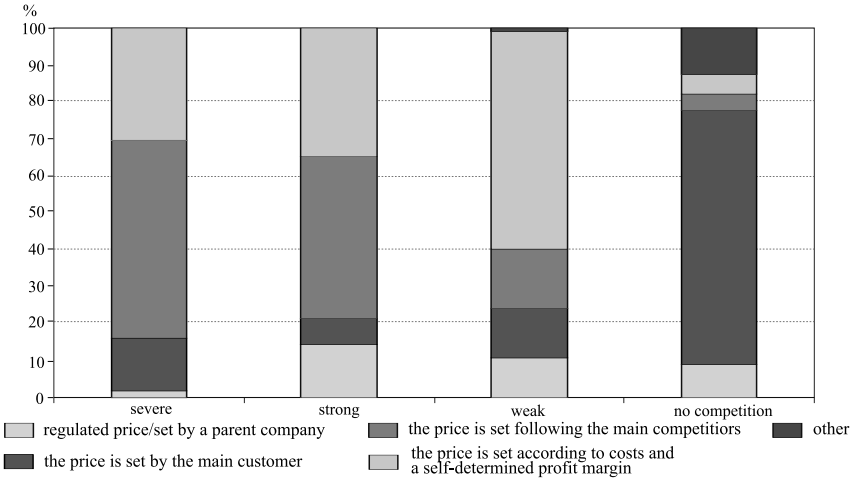
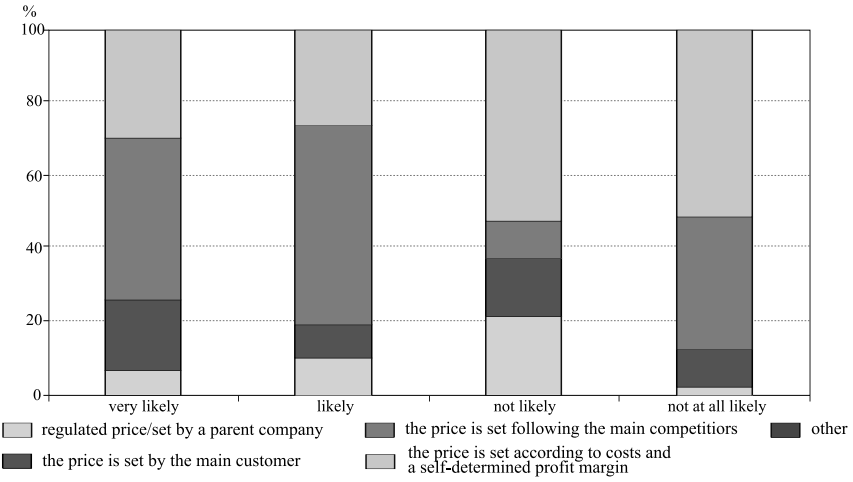



Figure 4

**PRICE SETTING BY LIKELIHOOD TO FOLLOW THE MAIN COMPETITOR'S PRICE DECREASE**



It is difficult to evaluate the possible effects of the time of implementation of the survey in Bulgaria (during the economic crisis) on the answers of respondents. It is plausible, however, to state that intensification of competitive pressures in some sectors compared to the pre-crisis period (possibly in the trade sector) may have influenced the pricing behaviour of firms towards heavier reliance on market conditions (i.e. through attaching greater importance to the behaviour of competitors).

Another perspective on the issue on price-setting patterns in Bulgaria can be obtained by the question whether firms take into consideration the pricing policy of sectoral/branch organizations in case they are members of such organizations. This question did not feature in the WDN and IPN questionnaires but was included in the Bulgarian survey in order to assess how relevant the possible existence of sectoral/branch organizations for overall price developments is. The survey reveals that on average for the three sectors about 67% of all firms do not participate in such organizations. Out of the remaining firms, however, two thirds declare that do take into account branch policies in their price change decisions, thereby forming almost 22% of all firms in the sample. Across sectors, membership in branch organizations is most prevalent in the manufacturing companies (40% of all companies) and least prevalent in the trade sector (28% of all companies). The manufacturing sector is also the sector where adherence to commonly agreed pricing policies is reported to be stronger (26% of all firms) compared to the other two sectors (where 19% of all firms respectively declare to be abiding by such sectoral policies).

The evidence of some relevance of common sectoral/branch pricing policies and its relation to price developments requires a more thorough analysis that goes beyond the scope of this paper. Nevertheless, it can be maintained that all measures aimed at enhancing competition at national/regional/local level could be conducive to more efficient pricing policies in the future. The analysis of the results of this survey indeed points that stronger competitive pressures are generally associated with higher flexibility of prices at firm level.

### *Reasons for price changes*

Empirical evidence on the determinants of price changes at firm-level allows more profound understanding of the driving factors of inflation dynamics at the aggregate level, including assessment of the importance of some factors that are difficult to model or capture in macro-models. Drawing from the questionnaires used within the IPN project, the Bulgarian survey included two questions on the main factors underlying price changes (one for price

increases and one for price decreases). The questions asked firms to evaluate the relevance for their price change decisions of a number of potential driving forces on a scale from 1 (not relevant) to 4 (very relevant). The potential driving forces for both price increases and price decreases consisted of (increases, respectively decreases) in wage costs, capital (loan interest) costs, intermediate input costs, prices of competitors, demand, regulated prices, inflation (to which prices are indexed), as well as changes in the forecasts on inflation and/or business activities. Apart from these factors, the question on the factors for price increases also included quality improvements, while improvements in productivity were added to the potential factors for price decreases.

*Factors for price increases*

On average for the three sectors the most important factor driving prices upwards is rising intermediate input costs which have a mean score of 3.4 (obtained as an average from the answers ranging between 1 "not relevant" and 4 "very relevant"). In terms of relevance, the factor related to increases in intermediate input costs stands well above all the other factors. This factor is chosen as very relevant or relevant by 91% of all firms. The importance of intermediate input costs for price increases as reported by firms could be related to one of the driving factors of inflation in Bulgaria, considering the fact that periods of a strong pick-up of inflation over the last years have occurred at times of commodity price increases on international and domestic markets.

Higher quality of firms' products and services is the second most important factor with a mean score of 2.9. Increases in demand and increases in competitors' prices rank third and fourth with mean scores of 2.7 and 2.6 respectively. Labour costs (average score of 2.2) and changes in forecasts on inflation or economic activity (average score of 2.1) are given least importance by firms in their price-increasing decisions.

Labour costs and raw materials prices are the key factors underlying price increases in euro-area countries according to the IPN results. As results for the euro area are based predominantly on firms operating in the industry sector, a more detailed analysis of determinants of price increases by sector in Bulgaria would allow us to gain insight into possible differences/similarities with euro area countries on the importance of different factors for price increases.

Table 5

**DRIVING FACTORS OF PRICE INCREASES**

| | Mean score | % important |
|---|---|---|
| Increase in intermediate input costs | 3.4 | 91.2 |
| Increase in quality | 2.9 | 69.1 |
| Increase in demand | 2.7 | 66.3 |
| Increase in competitors' prices | 2.6 | 61.0 |
| Increase in financial costs | 2.5 | 61.0 |
| Administrative increase in prices | 2.4 | 52.3 |
| Increase in inflation to which prices are indexed | 2.2 | 41.1 |
| Increase in labour costs | 2.2 | 36.2 |
| Change in the forecasts on inflation or economic activity | 2.1 | 33.0 |

**Note:** Results are employment-weighted. The indicator *% important* is the share of firms answering "very relevant" or "relevant". Firms are asked to evaluate the relevance for their price change decisions of a number of potential driving forces on a scale from 1 (not relevant) to 4 (very relevant). Mean score is the mean (average) result for the relevance that firms attach to each of the factors. Intermediate input costs include purchased goods and services or raw materials.

The breakdown by sector shows that similar to euro area firms, Bulgarian firms in the industry sector consider intermediate input costs as one of the most important factors driving increases in prices. Despite the fact that according to the Bulgarian survey, labour costs are attached somewhat higher relevance in the industry sector than in the services and trade sectors the average score of importance for the industry sector (2.4) is considerably lower compared to the results for euro area countries (average score of 3.0). The Bulgarian manufacturing sector considers quality improvements (average score of 2.9) and increases in demand (average score of 2.8) more important than labour costs in their decisions for raising prices. In contrast, demand factors are reported as relatively less important (2.2) by euro area companies in comparison with Bulgarian firms.[5]

[5] The summary of the IPN results for euro area firms does not include improvement in quality as a factor driving price increases. For this reason, the Bulgarian results of this indicator cannot be compared with those for euro area countries.

Table 6

**DRIVING FACTORS OF PRICE INCREASES BY SECTOR AND FIRM SIZE (MEAN SCORES)**

| | Sector | | | Firm size (No. of employees) | | | |
|---|---|---|---|---|---|---|---|
| | Manufacturing | Trade | Services | 5-19 | 20-49 | 50-199 | 200+ |
| Increase in labour costs | 2.4 | 2.0 | 2.1 | 2.2 | 2.4 | 2.2 | 2.1 |
| Increase in financial costs | 2.6 | 2.6 | 2.4 | 2.5 | 2.4 | 2.4 | 2.7 |
| Increase in intermediate Input costs | 3.3 | 3.6 | 3.2 | 3.3 | 3.5 | 3.3 | 3.5 |
| Increase in quality | 2.9 | 3.1 | 2.5 | 2.6 | 3.0 | 2.7 | 3.1 |
| Increase in competitors' prices | 2.4 | 2.8 | 2.5 | 2.7 | 2.9 | 2.5 | 2.4 |
| Increase in demand | 2.8 | 2.7 | 2.4 | 2.5 | 2.7 | 2.6 | 2.8 |
| Administrative increase in prices | 2.1 | 2.8 | 2.2 | 2.3 | 2.3 | 2.0 | 2.8 |
| Increase in inflation to which prices are indexed | 2.1 | 2.4 | 2.3 | 2.4 | 2.2 | 2.0 | 2.4 |
| Change in the forecasts on inflation or economic activity | 2.0 | 2.3 | 1.9 | 2.1 | 2.0 | 1.9 | 2.4 |

The relatively low relevance of wage costs for price increases in Bulgaria could be attributed to the combination of productivity growth over the last years preceding the crisis and the overall low labour share in the economy. Quality improvements and demand factors as determinants of upward price adjustments are in turn associated with the processes of real and nominal convergence of the Bulgarian economy.

Furthermore, the results by sector show that intermediate input costs are considered most relevant by trade firms (with a mean score of 3.6). A possible explanation for this result is the fact that in the questionnaire 'intermediate input costs' were specified as 'purchased goods and services or raw materials'. This implies that in the trade sector companies have also considered a part of their costs related to the costs of purchased goods. The survey also reveals that advances in quality and increasing demand are much more important in the trade and manufacturing sectors than in the market services sector. Given the higher competitive environment in the trade sector already identified, increases in competitors' prices unsurprisingly rank highest in this sector relative to the other two.

Additional evidence for the importance of demand factors for price increases can be obtained from the question on firms' reactions to an unanticipated significant increase in demand. On that question, 26% of all firms in the survey declare that they would increase the price of their product/service. The predominant reaction of firms to such a shock is hiring more people and/or doing more overtime (stated as relevant by 79% of all firms) and increasing investment and/or buying new facilities (stated as relevant by 71% of all firms).

*Factors for price decreases*

The information gathered from the survey reveals several main factors for price decreases on average for the three sectors: decline in intermediate input prices, improvements in productivity, weakening demand and lower competitor prices. While comparable results on productivity improvements are not available for euro-area countries, the finding that market conditions (demand and competitors' prices) are a key factor underlying downward price adjustments is one of the robust findings of the survey component of the IPN project.

Table 7

**DRIVING FACTORS OF PRICE DECREASES**

| | Mean scrore | % important |
|---|---|---|
| Decrease in intermediate input costs | 3.0 | 82.1 |
| Decrease in demand | 2.9 | 68.2 |
| Improvement in productivity | 2.9 | 72.0 |
| Decrease in competitors' prices | 2.8 | 67.0 |
| Decrease in financial costs | 2.3 | 50.2 |
| Administrative decrease in prices | 2.2 | 47.1 |
| Decrease in inflation to which prices are indexed | 2.2 | 39.4 |
| Change in the forecasts on inflation or economic activity | 2.1 | 37.8 |
| Decrease in labour costs | 1.8 | 18.7 |

**Note:** Results are employment-weighted. The indicator *% important* is the share of firms answering "very relevant" or "relevant". Firms are asked to evaluate the relevance for their price change decisions of a number of potential driving forces on a scale from 1 (not relevant) to 4 (very relevant). Mean score is the mean (average) result for the relevance that firms attach to each of the factors. Intermediate input costs include purchased goods and services or raw materials.

Results by sector show that for the trade sector market conditions receive the highest relevance for price decreases of all sectors (mean score of 3.2 for both demand and prices of competitors). In the industrial sector the most important determinant of such adjustments are productivity gains (mean score of 3.1) and the result is in line with productivity growth developments in this sector observed both prior to 2008 and over the period of economic crisis. Another important factor for price decreases according to firms in the industrial sector is lower intermediate input costs (mean score of 2.9). Compared to results for manufacturing firms in the euro area, where as mentioned above market conditions are the main factor for price decreases, we observe a somewhat lower importance of this factor in the manufacturing sector in Bulgaria against the background of somewhat higher relevance of productivity and cost-push pressures from intermediate inputs. In addition, decreases in intermediate input prices score highest in terms of relevance for downward price adjustments in the services sector.

Table 8

**DRIVING FACTORS OF PRICE DECREASES BY SECTOR AND FIRM SIZE (MEAN SCORES)**

| | Sector | | | Firm size (No. of employees) | | | |
|---|---|---|---|---|---|---|---|
| | Manufacturing | Trade | Services | 5-19 | 20-49 | 50-199 | 200+ |
| Decrease in labour costs | 1.8 | 1.8 | 1.7 | 1.9 | 1.9 | 1.8 | 1.7 |
| Decrease in financial costs | 2.2 | 2.4 | 2.5 | 2.5 | 2.4 | 2.3 | 2.3 |
| Decrease in intermediate input costs | 2.9 | 3.1 | 3.1 | 3.2 | 3.3 | 3.0 | 2.8 |
| Improvement in productivity | 3.1 | 2.8 | 2.5 | 2.6 | 2.9 | 2.7 | 3.1 |
| decrease in competitors' prices | 2.6 | 3.2 | 2.5 | 2.9 | 2.8 | 2.7 | 2.9 |
| Decrease in demand | 2.7 | 3.2 | 2.7 | 3.0 | 3.0 | 2.7 | 2.9 |
| Administrative decrease in prices | 2.0 | 2.5 | 2.0 | 2.2 | 2.1 | 1.9 | 2.6 |
| Decrease in inflation to which prices are indexed | 2.0 | 2.3 | 2.2 | 2.3 | 2.1 | 1.9 | 2.4 |
| Change in the forecasts on inflation or economic activity | 2.0 | 2.4 | 1.8 | 2.1 | 2.0 | 1.9 | 2.3 |

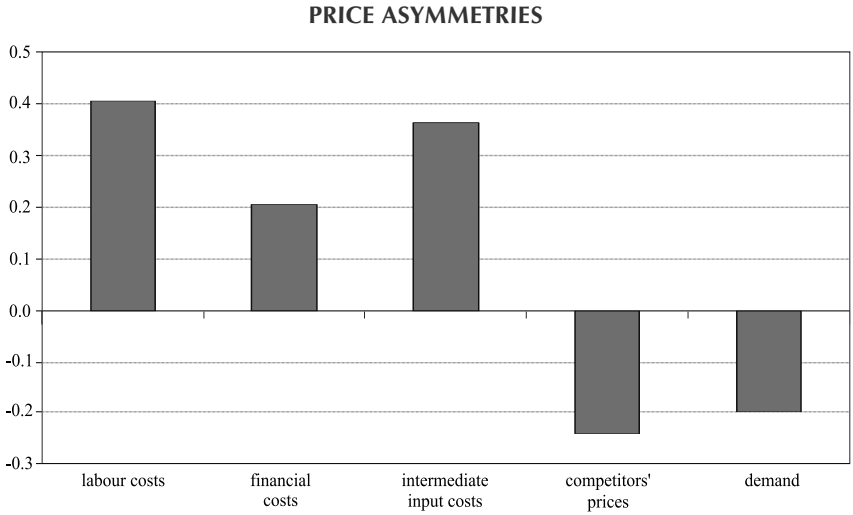
Further evidence on the relevance of declines in raw materials prices for price decreases can be obtained by the question on firms' reactions to an unanticipated significant decrease in intermediate input prices. The results on that question reveal that decreasing prices is stated as a relevant reaction by about 60% firms in case of such a shock, which lends support to the finding that declines in raw materials prices are one of the important factors underlying price decreases. This question further shows that increasing profit margins – another option cited as a possible reaction to this shock – is also considered relevant by Bulgarian firms (72% of all firms stated that they would follow such a strategy).

*Price asymmetries and impact of competition on pricing policies of firms*

Results from the Bulgarian survey appear to confirm an important regularity obtained by the survey part of the IPN project for euro-area countries that relates to the existence of asymmetry of price reactions. The asymmetry of price reactions is based on the fact that costs most often lead to price changes when they increase, while variations in demand are generally more important for price decreases than for price increases. This regularity was confirmed by the survey results for all euro-area countries that participated in the IPN project despite their varying business cycle positions at the time the national surveys were conducted. A survey of the degree of price stickiness in the United Kingdom also showed such asymmetries in price adjustments (Hall et al., 2000).

Following Fabiani et al. (2005) we first take the already obtained mean scores of importance given by firms for price increases and decreases to costs factors (labour costs, financial costs and intermediate input costs) and demand factors (competitors' prices, demand). Then for each of the factors we estimate the difference between the score given for upward price adjustments and the score given to that factor for downward price adjustments. Similarly to the results for euro area countries, we can reach the conclusion that costs are a more relevant factor for firms when they are on the increase and respectively firms increase prices. At the same time, market factors seem to be more important for firms when they deteriorate (i.e. demand contracts or competitors decrease their prices) and then firms lower their prices, whereas improving market factors are somewhat less important for price increases.

Figure 5




**Note:** Following Fabiani et al. (2005) the graph represents differences between the mean scores for price increases and the mean scores for price decreases for each of the cost and demand factors respectively.

Another robust finding of the IPN project that seems to be supported by the Bulgarian survey is that higher competition results in firms attaching stronger importance to changes in underlying factors (particularly in the case of weakening demand) when making decisions regarding price changes. This conclusion can be reached using any of the two measures of competitive pressures faced by firms. As for the surveyed firms in the euro-area countries, when Bulgarian firms are faced with higher competition they appear to attach higher importance to decreasing demand when price change decisions are made than the importance given to decreasing demand in the case when firms are faced with lower competition.

Figure 6

**PERCEIVED COMPETITION AND IMPORTANCE OF PRICE-RISING FACTORS**

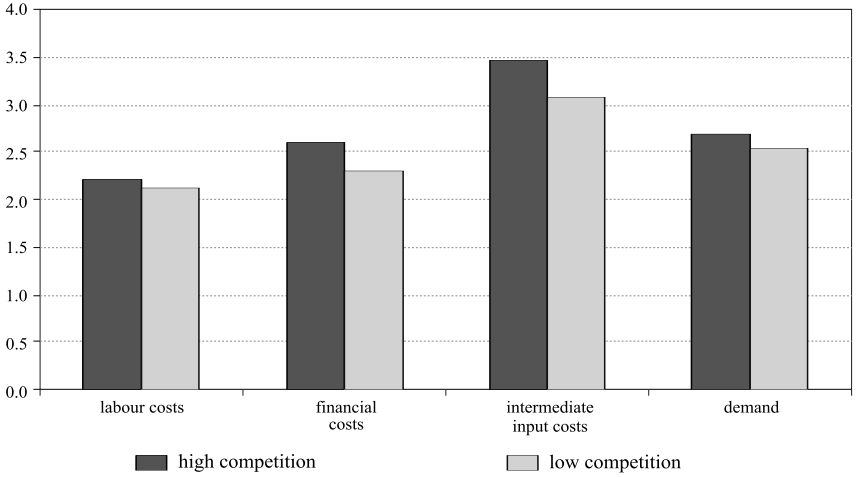
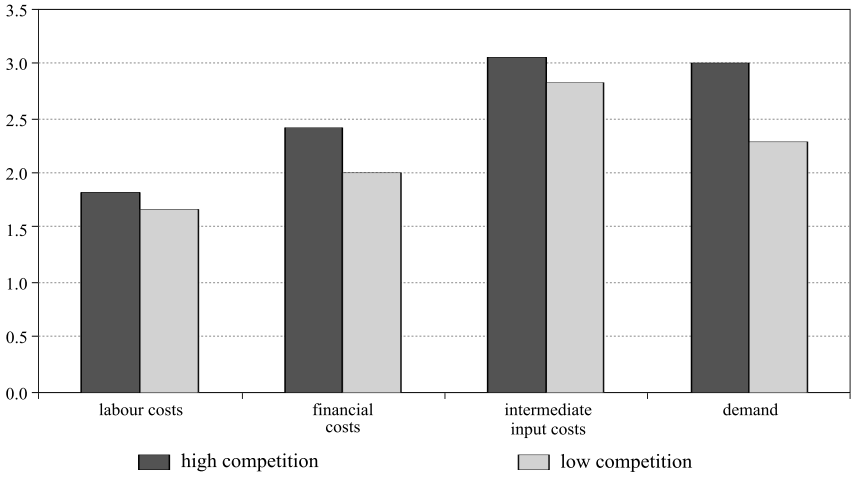



Figure 7

**PERCEIVED COMPETITION AND IMPORTANCE OF PRICE-REDUCING FACTORS**




**Note:** The scores for the importance of the different price-raising and price-reducing factors in an environment of "high"/respectively "low" competition are obtained by a weighted average of the scores on "severe" and very strong" competition in the first case and on "weak" or "no competition" in the second case.

### *Price flexibility*

Flexibility of prices can generally be related to the speed of price adjustment that takes place following a shock to underlying factors in the economy (e.g. demand or costs). Some of the most widely used measures of price flexibility include the frequency of price changes (without ignoring the fact that a low frequency is not necessarily an indicator of price stickiness in the absence of variability in underlying factors), the time dependence or concentration of the decisions on price changes in a particular period of the year (higher dependence possibly implying slower reaction to shocks) and the actual speed of adjustment of prices in response to shocks as declared by firms.

Evidence from EU countries both within the IPN and WDN research project has convincingly shown that price flexibility (most often referred to price change frequency) is dependent on a number of characteristics of product markets (type of sector, degree of competition, etc.) and on many firm-specific characteristics such as size of companies, export orientation of their production, structure of costs and composition of the workforce employed in the firm. Consequently, cross-country heterogeneity with respect to price flexibility is relatively subdued, whereas sectoral differences are much more pronounced.

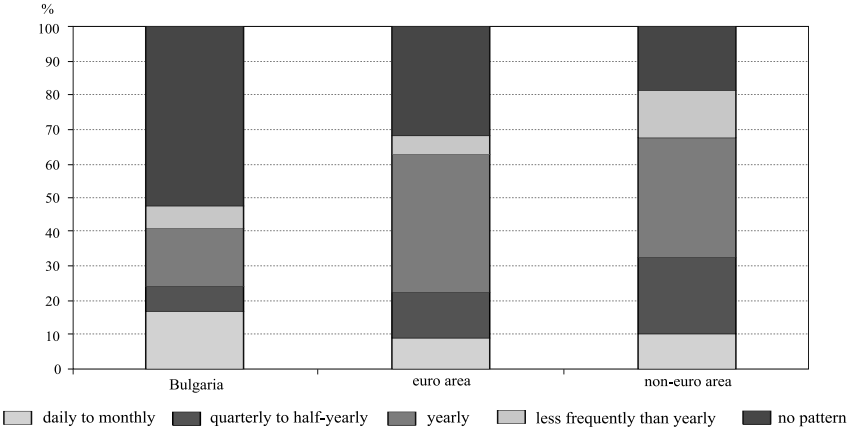
This section examines the results of the Bulgarian survey on price flexibility, looking at the frequency of price adjustments and the time-dependence of price changes and compares them to the results for European firms. We also analyse the evidence on the speed of adjustment of prices to shocks as reported by firms.

*Frequency of price changes*

The survey reveals that one of the main features of price change frequencies in Bulgaria is that firms generally do not follow a specific time-dependent pattern in their decisions for price changes: 52.3% of firms state that they have no predefined time-pattern, with almost no variation of this proportion across different sectors and firm sizes. The share of firms with no pattern in changing prices (i.e. with irregular price changes) is almost twice as high as the average figure for EU countries. Future research could investigate the possible factors for the relatively high incidence of irregular price changes in Bulgaria and attempt to extract some underlying frequency of these changes.

Figure 8

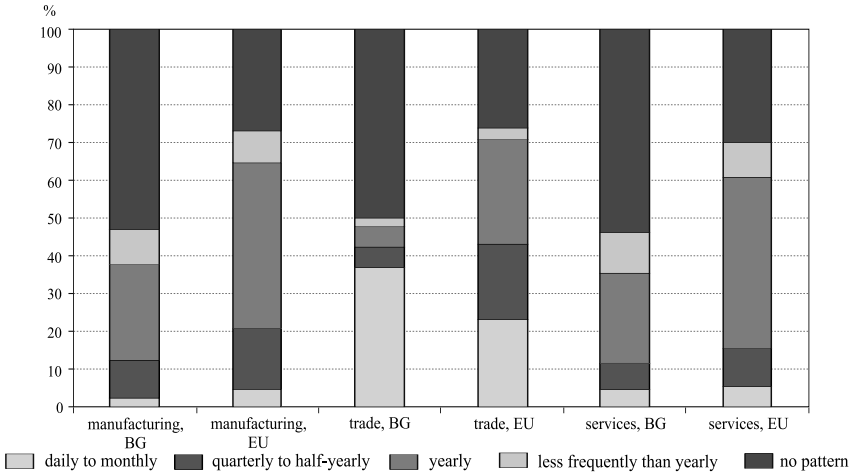
**FREQUENCY OF PRICE CHANGES IN BULGARIA AND COMPARISON WITH WDN RESULTS**




**Source:** Druant (2009) for euro area and non-euro area countries.

Figure 9

**FREQUENCY OF PRICE CHANGES ACROSS SECTORS IN BULGARIA AND COMPARISON WITH WDN RESULTS**




**Source:** Druant (2009) for EU countries.

The survey results also show that prices in Bulgaria change more frequently than both in euro-area and non-euro area countries. In Bulgaria 16.5% of firms change prices on a daily-to-monthly basis (against 9.2% on average for the EU), 7.5% of firms change their prices on a quarterly-to-half-yearly basis (15.4% in the EU), 17.0% change prices yearly (39.2% in the EU) and 6.7% less frequently than yearly (7.4% in the EU).

As documented by Druant et al. (2009) for the EU countries, clear sectoral patterns in price change frequencies can be seen in the Bulgarian data too. Trade firms tend to adjust their prices much more often than both the manufacturing and services sectors. One of the findings of the survey is that 37.2% of trade firms in Bulgaria change prices with a daily-to-monthly frequency, which is well above the average figure for the EU of 22.9%.

A further analysis of price change frequencies can be done excluding the firms with no defined time-dependent pattern in adjusting prices. This approach follows Druant et al. (2009) who argue that the lack of effective frequency of price changes of the firms "with no pattern" justifies dropping all firms in that category. We note, however, that in the case of Bulgaria such an assumption removes slightly more than half of all companies.

Estimates of the duration of price spells (which is defined as the number of months for which prices remain unchanged) show that on average for the three sectors this duration is lower in Bulgaria (7.7 months) than the average duration obtained from the results for the EU (9.6 months for both euro area and non-euro area countries).[6] Even more importantly, the average time period during which prices in Bulgaria remain unchanged is the shortest among all countries. This result is driven mainly by the extremely short duration of prices in the trade sector (2 months against almost 7 months for the EU). At the same time, price spells in the manufacturing and services sectors are broadly similar (around 10–11 months) which is close to the average EU figures.

In general, we cannot make a clear-cut conclusion about the flexibility of prices in Bulgaria based only on the survey results for the frequency of price changes. The main reason for this lies in the fact that a large number of the companies in all sectors have no predefined time-dependent pattern in the frequency of their prices changes. In addition, when excluding the companies with no time-dependent practice in adjusting prices, the results point to an average duration of price spells in the manufacturing and services

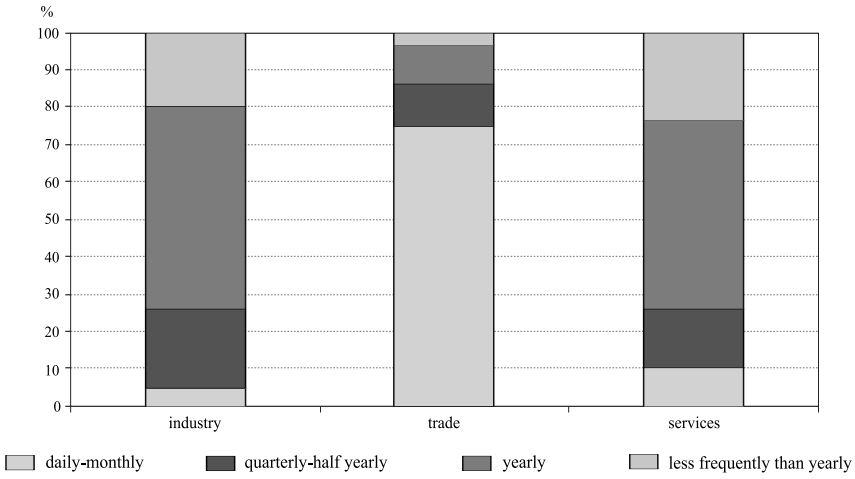
[6] The results from the question on the frequency of price changes form discrete distribution. Therefore, in order to obtain average durations, this distribution is approximated by continuous lognormal distribution. For more details on the estimation, see Druant (2009).

sectors that is close to the results for the EU countries. The relatively higher frequency of price changes in the trade sector against the background of the results for the EU needs to be examined in more detail in future research that could focus especially on the market environment of firms in this sector.

The above sectoral differences with respect to price formation, reasons for price changes and price frequencies lead to the conclusion that the trade sector in Bulgaria is characterized by a very high flexibility of prices that is possibly associated with the environment of relatively high competitive pressures in that sector. The latter may be explained by the increasing competition in that sector over the last years due to the extensive penetration of international competitors on the market and the eventual lowering of the market power of local firms.

Figure 10

**PRICE CHANGE FREQUENCY BY SECTOR**




The positive link between degree of competitive pressures and frequency of price adjustments is a major finding of both the IPN and WDN projects. It appears to be confirmed by the Bulgarian data not only when considering the price-setting patterns in the trade sector but also when directly examining the distribution of price change frequencies according to strength of competitive pressures. As can be seen, when firms perceive their competition as severe/strong and when they state that they are likely to follow the price decrease of their main competitor, the frequency of reported price changes is generally higher than in the cases when competition is perceived as low and the likelihood to follow the main competitor's price decreases is also low.

Figure 11

**PRICE CHANGE FREQUENCY BY TYPE OF PERCEIVED COMPETITION**

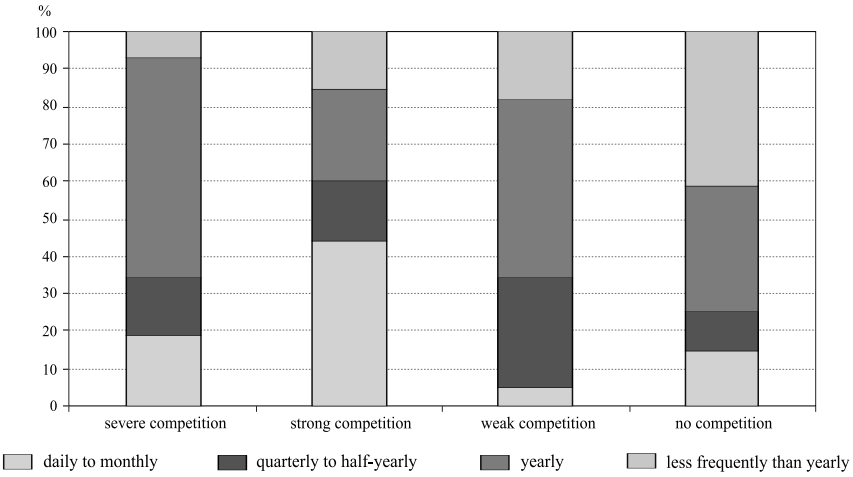
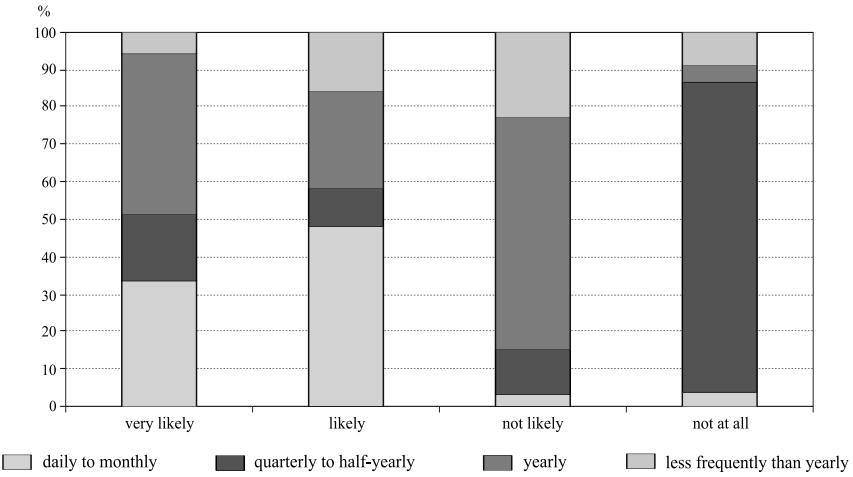



Figure 12

**PRICE CHANGE FREQUENCY BY LIKELIHOOD TO FOLLOW THE PRICE DECREASE OF THE MAIN COMPETITOR**




Moving beyond the issue of competition and price setting, the Bulgarian survey reveals that two other main results from the IPN and WDN projects on the determinants on price change frequencies – a negative link with the share of labour costs in total costs and a positive link with firms' exposure

to foreign markets – do not seem to hold about Bulgarian firms. A possible explanation for the absence of a link with the share of labour costs could be the relatively low labour share in the Bulgarian economy, implying that labour cost changes are not an important determinant of price changes. This result is also supported by the already obtained evidence from the survey on the determinants of price increases where, as mentioned above, firms do not assign high relevance to increases in wages when raising prices. A factor that may account for the observed absence of an association between the export orientation of firms' production and the frequency of their price changes is the fact that almost one third of the manufacturing companies do not have an independent pricing policy as described in the section on pricing strategies.

Figure 13

**PRICE CHANGE FREQUENCY BY SHARE OF LABOUR COSTS IN TOTAL COSTS**

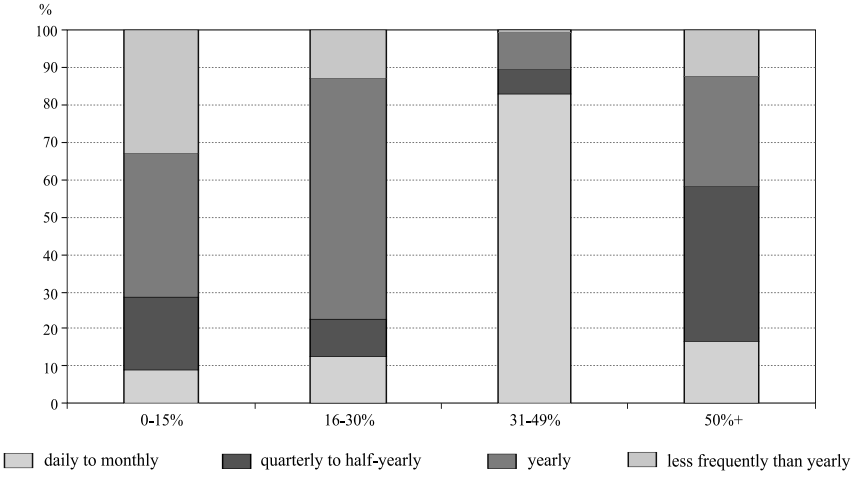
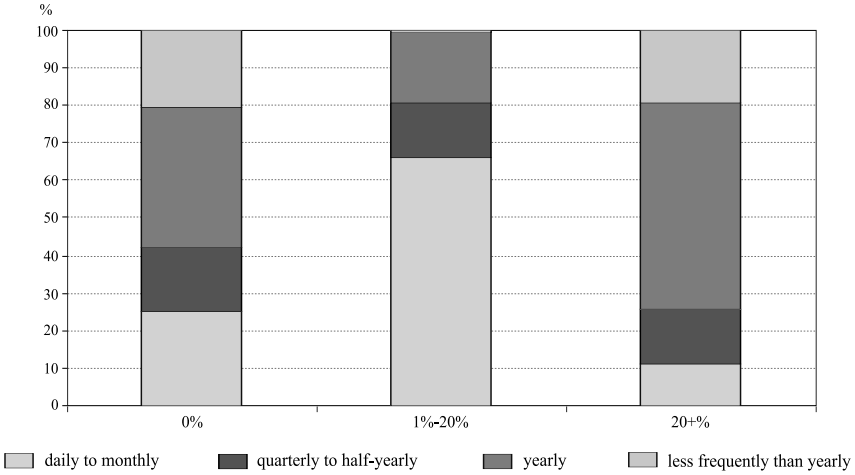


Figure 14

**PRICE CHANGE FREQUENCY BY EXPORT SHARE**




*Time dependence of price changes*

The second measure of price flexibility that we examine is the time-dependence in firms' decisions on price changes. Higher concentration of price changes in a particular time of the year (e.g. in the beginning of each year) could be an indication of price stickiness in response to shocks to the economy and delay the adjustment of the economy to these shocks. As observed by Fabiani et al. (2005), time-dependent price setting may be associated with nominal rigidity in prices in the case of shocks.

To assess the degree of time dependence of price changes, the survey includes a question that asks respondents explicitly whether under normal circumstances price changes are concentrated in any particular month/months of the year.

Price concentration in Bulgaria is done by 12% of all firms. This is much lower than the respective average figure for euro area countries (42%) and it is also lower than the average for non-euro area countries (17%). Comparison with non-euro area countries reveals that price concentration in Bulgaria is actually one of the lowest. A price concentration pattern is mostly pronounced in the manufacturing sector (20.5% of firms) and least pronounced in the trade sector (4.9% of all firms follow a time-dependent pattern in price adjustments). The result on the relatively low time-dependence of price adjustments in Bulgaria could be interpreted as an indicator of flexibility of prices in the country.

Furthermore, compared to EU results synchronization of wage and price changes is much less prevalent in Bulgaria due mostly to the low time-dependence of price changes. As in the EU, however, wage concentration in a particular month is higher (43% of firms) compared to price concentration, with peaks in January in both cases.

Figure 15

**PRICE AND WAGE CHANGE CONCENTRATION**

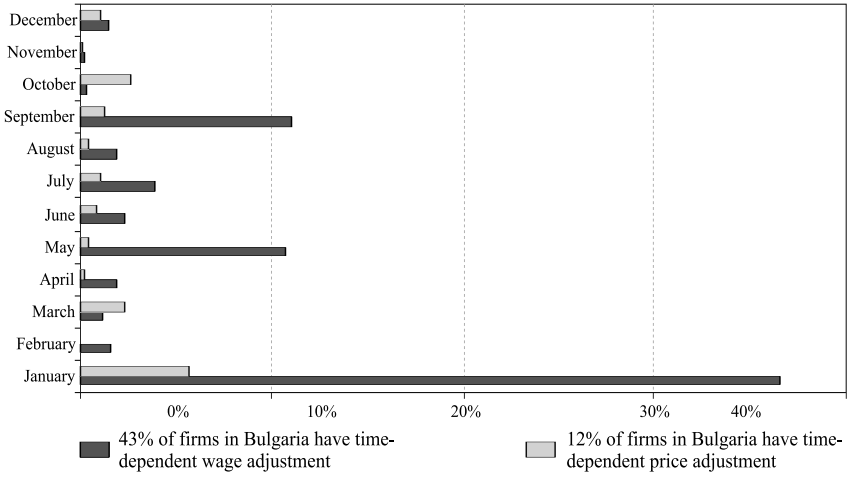
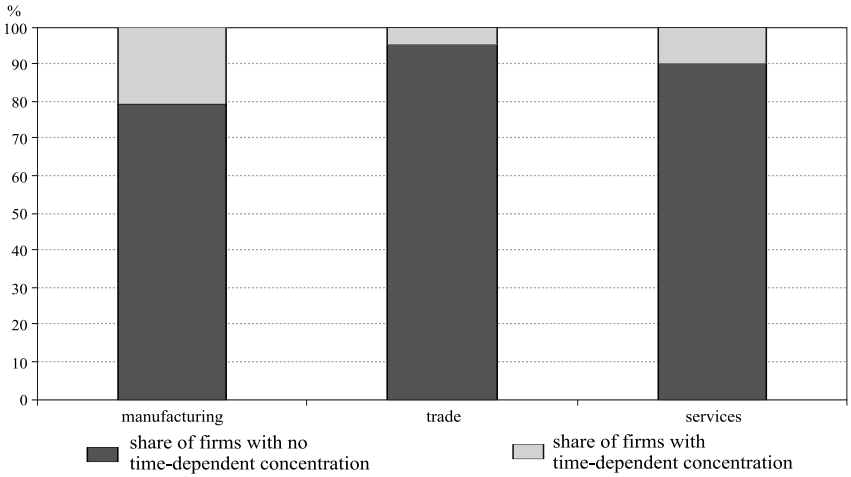



Figure 16

**PRICE ADJUSTMENT CONCENTRATION IN A PARTICULAR MONTH(S) OF THE YEAR BY SECTOR**



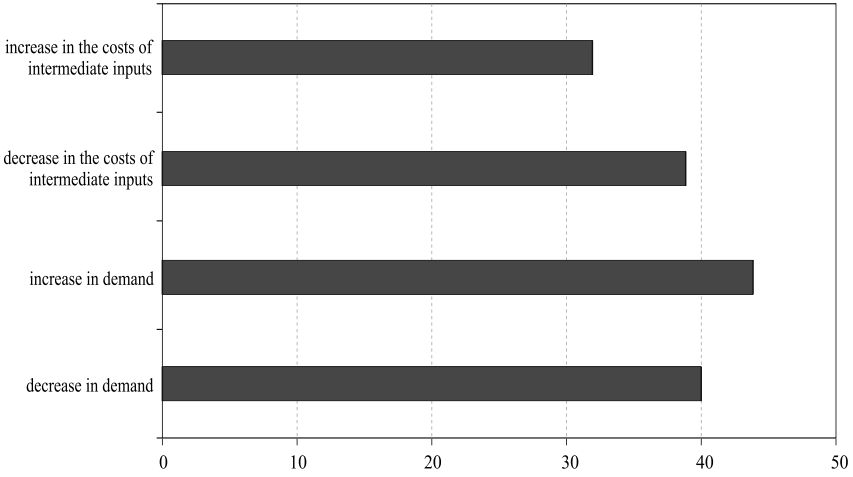
*Reported speed of price adjustment after shocks*

The third measure that could provide information on the flexibility of prices is the speed with which firms report to make adjustments of prices following the incidence of shocks to the economy. The national surveys conducted within the IPN project contained a number of questions on the speed of price changes in response to shocks, with some of the countries explicitly differentiating their questions with respect to the significance (degree) of the shock. Despite the important information that can potentially be given by the speed of price changes after different shocks, the length and complexity of the questionnaire in the Bulgarian survey did not allow to make a strict differentiation with respect to the degree of the shock. The survey included only one question which asked firms whether they change prices after shocks to demand (increase/decrease) and shocks to intermediate input costs (increase/decrease). Three options were given (prices are changed after a specific number of weeks, prices are changed after a specific number of months and prices are not changed).

The aggregate results for the three sectors reveal that prices in Bulgaria respond quickly to all of the shocks irrespective of their source and sign (positive vs. negative). Unsurprisingly, somewhat faster reaction of prices is observed in the case of changes in the prices of raw materials compared to changes in demand. The median length of price response to lower/higher demand is 6 weeks/5 weeks respectively, with 60% and 56% of all firms respectively responding to these shocks. The median length of price adjustments to declining/rising raw materials prices is 3 weeks for both cases, with slightly stronger response by firms to raw materials price increases (68% of firms) relative to decreases (61% of firms).

Figure 17

**PRICE ADJUSTMENT AFTER SHOCKS**
**(% OF FIRMS NOT CHANGING PRICES)**




### *Wage – price links*

The analysis of the link between wages and prices is particularly important because it allows an assessment of the possible short and long-term effects of different shocks to the economy (e.g. an increase in oil prices), including the impact of such shocks on firms' competitive positions. The survey shows that the wage-price link in Bulgaria is weaker compared to the average for the EU countries. As already mentioned in the section on reasons for price changes above, increases in wage costs have very low relevance for firms when upward price adjustments are implemented. Further evidence for the conclusion about a relatively weak wage-price link is given by the results on how firms relate price changes to wage changes, how important it is for firms to increase prices after an unanticipated permanent increase in wages, whether firms have policies of adapting wages to inflation and how frequently wages are changed due to inflation.

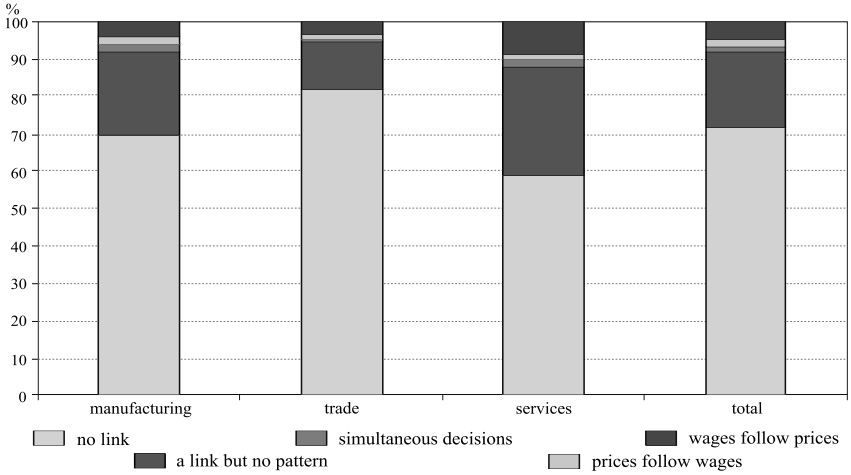
According to the survey 27% of firms in Bulgaria acknowledge that they have a link between prices and wages which is smaller when set against the average figure for the EU (about 40%). Unlike in the EU, however, there are differences in the relationship between wages and prices across sectors.

The link is somewhat stronger in the services sector (40% of firms) relative to the manufacturing sector (30% of firms) and the trade sector (17% of firms).

Further evidence about a relatively weak wage-price link is provided by the fact that only 8% of all firms report to maintain a strong link, almost twice as low as the EU figure. As in Druant et al. (2009), we consider that the link is strong in those firms where there is some specific pattern in the changes in price and wages: decisions about wages and prices are taken simultaneously, prices follow wages or wages follow prices. Again, there are clear sectoral differences in the strength of the link. In the services sector 12% of firms report the existence of a strong link, while the number for the manufacturing sector is 8% of firms and for the trade sector is 5% of firms. It is also noteworthy that the dominant relationship between wages and prices across sectors is that wages follow prices (this direction is reported by 9% of firms in services, 4% of firms in manufacturing and 3% of firms in trade).

Figure 18

**RELATION BETWEEN THE TIMING OF PRICE AND WAGE CHANGES**




We can also draw inference on the extent to which wage changes have a pass-through to price changes by considering the reaction of firms to an unanticipated permanent increase in wages (in the questionnaire we specified that such an increase could be due to an increase in the minimum wage at a national level). The results show that 43% of firms in Bulgaria (in the sectors covered by the survey) would increase prices in response to such a shock,

whereas in the EU prices will be increased by 60% of all firms.[7] Interestingly, in Bulgaria the strongest reaction is observed in the trade sector: slightly more than half of all firms in this sector state that they will increase prices compared with 39% in manufacturing and 32% in services sectors. This result confirms aggregate statistics on wages in the trade sector which are relatively low, with their dynamics by months showing relation to the increase in the minimum wage in 2009 (BNB Economic Review, 4/2009).

The link between wages and prices can also be assessed with the question whether firms have a policy of adapting changes in base wages to inflation. The results from that question confirm the finding that the link in Bulgaria is lower than on average in the EU.

Table 9

**DOES YOUR FIRM HAVE A POLICY THAT ADAPTS CHANGES IN WAGES TO INFLATION?**

| | Bulgaria | Euro area | Non-euro area |
|---|---|---|---|
| No | 75.0% | 65.3% | 61.9% |
| Yes | 25.0% | 34.7% | 38.1% |

**Note:** Share of firms. Results are employment-weighted and re-scaled excluding non-responses.
**Source:** Final report of the Wage Dynamics Network (ECB, 2010) for euro area and non-euro area.

In Bulgaria 25% of firms state that they have a policy that indexes wages to inflation. For the euro area such a policy is applied by 35% of the companies, while in the non-euro area countries wages are adjusted to inflation by 38% of companies.

The evidence on the impact of inflation on wages can be complemented by the question on the frequency of wage changes due to inflation. The results provided by the survey on that question are that wages in Bulgaria are changed mainly because of length of service and reasons apart from length of service and inflation. Wage updates due to inflation are not widespread: a striking difference from the EU where inflation is reported as the main driving factor of frequent changes in wages.[8]

[7] The reported shares of firms for the EU and Bulgaria include the respondents attaching "high relevance" or "relevance" to an increase in prices after a wage shock. Source for the results on EU countires: Final Report on the Wage Dynamics Network (ECB, 2010).

[8] Lozev, I., Z. Vladova and D. Paskaleva, "Wage Setting Behaviour of Bulgarian Firms: Evidence from Survey Data, Bulgarian National Bank, Discussion Paper, DP 87/2011.

## Conclusions

The main features of the price-setting behaviour of Bulgarian enterprises in the three sectors covered by the survey (manufacturing, trade and market services) can be summarized as follows.

The survey results suggest that prices in Bulgaria can be characterized as flexible. An indication of the flexibility of prices is given by the fact that the most common price-setting practice among the companies in the three sectors is that of following competitors' prices. The relevance of competitors' prices for price setting is reported by 40% of all companies, whereas the second most frequently used pricing rule is that of a mark-up over costs (it was reported by one third of all companies). Following competitors' prices is the predominant price-setting pattern in the trade sector (53% of all firms apply this strategy) against the background of reported stronger competitive pressures in this sector compared to the manufacturing and market services sectors. The low time concentration of price changes in a particular month(s) of the year, which is among the lowest from the non-euro area countries, and the reported fast response of prices to upward and downward shocks to cost and demand factors also show that prices in Bulgaria can be described as flexible.

No clear-cut conclusion about the flexibility of prices in Bulgaria can be made based on the results for the frequency of price changes. The main reason for this lies in the fact that a large part of the companies in all surveyed sectors have no predefined time-dependent pattern in the frequency of their prices changes. In addition, when excluding the companies with no defined time-dependent practice in adjusting prices, the results point to an average duration of price spells in the manufacturing and services sectors that is close to the results for the EU countries. The trade sector reports much higher frequency of price changes against the background of the results for the EU. This result could be examined in more detail in future research that focuses especially on the market environment of firms in the trade sector.

The preliminary analysis of the results from the Bulgarian survey confirms several main findings from the IPN project. First, higher levels of competition are associated with lower prevalence of price-setting rules based on a mark-up over costs. Second, when firms are faced with high competitive pressures that also possibly imply lower profit rates, firms appear to attach stronger importance to changes in underlying factors (particularly in the case of weakening demand) when making decisions on price changes. Third, higher competition tends to be related to higher frequency of price changes. Conversely, the Bulgarian survey does not appear to confirm the key finding from both the WDN and IPN projects that a low share of labour costs in firms' total costs accounts for a higher frequency of price changes.

A key finding of the survey is that the link between wages and prices is relatively weak in Bulgaria. A specific link between price and wage changes is reported by a lower number of firms compared to average EU figures. In addition, firm-level practices of updating wages to inflation are less widespread than both in the euro area and non-euro area countries. Furthermore, inflation driven wage changes are not widespread, as is the case in the EU, where inflation turns out to be the main reason for such developments. The pass-through from wages to prices is also comparatively weak.

The main factor underlying price increases at firm level is intermediate input costs. Labour costs are significantly much less important in determining upward price adjustments in stark contrast to the euro area where they stand as one of the main factors underlying price increases. Improvements in quality and demand factors rank second and third in importance for price increases respectively and this finding may be attributed to the processes of real and nominal convergence of the Bulgarian economy.

The main results of the survey point to an overall conclusion about flexibility of prices and a comparatively weak wage – price link in Bulgaria which suggests that the economy can maintain its competitiveness with second-round effects being limited in case of negative shocks. The finding about flexibility of prices in Bulgaria lends support to previous empirical results of a generally moderate degree of inflation persistence at an aggregate level in the country.[9] The descriptive analysis of the survey results also provides evidence that higher competition increases the flexibility of prices – a robust finding of both the WDN and the IPN projects. Consequently, measures to enhance competition in Bulgaria will further increase the overall flexibility of the economy with beneficial effects on the convergence process.

[9] For more details see "Empirical Analysis of Inflation Persistence and Price Dynamics in Bulgaria", BNB Discussion Paper, DP/70/2008.

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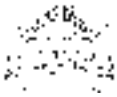
# Appendix



BULGARIAN
NATIONAL BANK

**SURVEY**
**ON WAGE AND PRICE FORMATION IN THE NON-FINANCIAL ENTERPRISES IN BULGARIA**

This survey is aimed at collecting information on wage and price setting practices in your firm and at identifying the relationship between wages and prices.

This survey is part of a project undertaken by the Eurosystem which includes the national central banks of euro area countries and the central banks of the other EU member states. The project uses a harmonized questionnaire, which is given to a sample of enterprises in each of the countries.

In Bulgaria the survey is funded by the Bulgarian National Bank (BNB).

The information collected through the questionnaire will be used exclusively for research and analysis purposes and will be disseminated and published outside the BNB only in aggregate format based on the answers by all firms included in the sample. Individual answers by each firm will be treated on a strictly confidential basis.

Participating firms will receive a summary of the main results of the survey.

Your cooperation is extremely valuable, but your participation is totally on a voluntary basis and your eventual refusal to cooperate and participate will not have any implication for your firm.

Instructions for filling the questionnaire:

1. *Who is the most suitable person for filling the questionnaire?* – Due to the complex nature of the questions, the questionnaire should be filled in by members of the senior management of the firm: executive director, finance director or human resource director.
2. *Questions that require answers with numbers* – if you have problems filling up exact numbers, please give your estimate with an approximate answer.

**CONTACT DETAILS OF THE PERSON WHO HAS COMPLETED THE QUESTIONNAIRE:**

Name: .....

Position: .....

Telephone number: .....

Date: .....

e-mail: * .....

* The summary with the results of the survey will be sent to this email.

| **Part 1 – Wage setting and wage changes** | | |
|---|---|---|
| **This part of the questionnaire collects information on wage setting practices and on the frequency and timing of wage changes in your firm. It also focuses on how the wages of new workers are set relative to existing workers.**<br>**Unless specifically indicated, answers should refer to "normal conditions and practices" in your firm.** | | |
| **1 – How were your firm's employees distributed across the following occupational groups in the end of 2008?**<br>**Please fill in <u>one of the two columns according to your preference: number or %</u>.**<br>***<u>Definition for employees:</u> employees are the people who have a labor contract with the employer according to the Labor code, based on which contract they receive remuneration in pecuniary form or in kind as a wage for work done with a certain quantity and quality, regardless of whether the labor contract is permanent or temporary, for full-time or for part-time.*** | | |
| 1. Management positions / Other (Class 1 according to the Labor code) | _____ % | _____ (give number) |
| 2. High-skilled white collars/ Experts (Class 2 according to the Labor code) | _____ % | _____ (give number) |
| 3. High-skilled blue collars/ Technical (Class 3 according to the Labor code) | _____ % | _____ (give number) |
| 4. Low-skilled white collars/ Clerical (Class 4 according to the Labor code) | _____ % | _____ (give number) |
| 5. Low-skilled blue collars/ Production (Classes 5, 7-9 according to the Labor code) | _____ % | _____ (give number) |
| **TOTAL** | **100 %** | _____ (total number) |

*Class 1 – Managers and Directors/Other*

*Class 2 - Analysts/ Experts*

*Class 3 - Technicians/ Technical*

*Клас 4 – Administrative positions/ Clerical*

*Class 5 – Employees providing services to the public, involved in trade or security/ Production*

*Class 7 –Qualified production specialists/ Production*

*Class 8 – Machine operators and fitters/ Production*

*Class 9 – Professions that do not require special qualification/ Production*

| **2 – Does your firm apply a collective contract signed outside the firm (e.g. at the sectoral or occupational level)?**<br>**Please choose <u>one answer</u>!** | |
|---|---|
| 1. No, it does not exist | □ |
| 2. No, we opt out | □ |
| 3. Yes, we apply it | □ If you have chosen this option, please also answer **question 4** |
| **3 – Independently of what answered in 2, does your firm apply a collective contract signed at the firm level?** | |
| 1. Yes | □ If you have chosen this option, please also answer **question 4** |
| 2. No | □ |
| **4 – If yes in 2 or 3, what percentage of your firm's employees are covered by collective agreements (at any level) ?** | |
| _____ % | |
| **5 – What percentage of your total wage bill in 2008 was related to individual or company performance related bonuses or benefits?**<br>***<u>Definition for bonuses/benefits (flexible wage components)</u>: additional material remuneration in the*** | |

***form of monthly and quarterly bonuses; annual bonuses, 13-th and 14-th wages.***

_____ %

**6 - Does your firm have a policy that adapts changes in base wages to inflation?**

***Definition for base wage: direct remuneration (for time worked or for work done) that excludes bonuses / benefits***

| | |
|---|---|
| 1. No | □ →If you choose this option, **go to question 8** |
| 2. Yes | □ → If you choose this option, **continue with question 7** |

**7 -Please choose among the options below, the one that reflects best such a policy.**

**Please choose one answer!**

| | |
|---|---|
| Wage changes are automatically linked to: | |
| 1. past inflation | □ |
| 2. expected inflation | □ |
| Wage changes take into account, without a formal rule: | |
| 3. past inflation | □ |
| 4. expected inflation | □ |

**8 - What is the principle of remuneration for the main occupational group (as defined in question 1)?**

**You may choose more than one answer!**

| | |
|---|---|
| 1. Hourly wage | □ |
| 2. Piece-rate wage – article 247, paragraph 2 of the Labor code | □ |
| 3. Monthly wage (or other period-specific wage, e.g.weekly) | □ |
| 4. Other (please specify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**9 - How frequently is the base wage of the main occupational group in your firm (as defined in question 1) typically changed in your firm?**

**Please give one answer on each row!**

| | *more than once a year* | *once a year* | *once every two years* | *less frequently than once every two years* | *never / don't know* |
|---|---|---|---|---|---|
| 1. Wage changes apart from tenure and inflation | 1 | 2 | 3 | 4 | 5 |
| 2. Wage changes due to tenure | 1 | 2 | 3 | 4 | 5 |
| 3. Wage changes due to inflation | 1 | 2 | 3 | 4 | 5 |

**10 - Under normal circumstances, are base wage changes concentrated in any particular month / months?**

**You may choose more than one answer!**

1. No □

| | |
|---|---|
| Yes: | |
| 2. January □ | 8. July □ |
| 3. February □ | 9. August □ |
| 4. March □ | 10. September □ |
| 5. April □ | 11. October □ |
| 6. May □ | 12. November □ |
| 7. June □ | 13. December □ |

**11 - Considering the main occupational group in your firm (as identified in question 1), please indicate among the following options what is the most relevant factor in determining the entry wage of newly hired employees:**

**Please choose one answer!**

| | |
|---|---|
| 1. Collective wage agreement (at any level) | □ |
| 2. Wage of similar employees in the firm | □ |
| 3. Wage of similar workers outside the firm | □ |
| 4. Availability of similar workers in the labour market | □ |
| 5. Other (please specify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**12 - If there is abundancy in the labour market of workers you need to hire, do you give newly hired employees significantly lower wage than that of similar (in terms of experience and qualitfication) employees already in the firm?**

**Please choose one answer!**

| | |
|---|---|
| 1. Yes | □ |
| No, because (**please choose only one option, the most important reason**): | |
| 2. It would be perceived as unfair and earn the firm bad reputation | □ |
| 3. It would have a negative effect on the work effort of the new employees | □ |
| 4. It is not allowed by labour regulation or collective wage agreement | □ |
| 5. Unions would contest it | □ |
| 6. Other reason (please specify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**13 - If there is a shortage in the labour market of workers you need to hire and attracting new workers is difficult, do you give newly hired employees significantly higher wage than that of similarly qualified employees already in the firm?**

**Please choose one answer!**

| | |
|---|---|
| 1. Yes | □ |
| 2. No, because (please choose only one option, the most important reason): | |
| 3. It would be perceived as unfair by existing employees | □ |
| 4. It would have a negative effect on work effort of the employees in the firm | □ |
| 5. It is not allowed by labour regulation or collective wage agreement | □ |
| 6. It would generate wage demand by existing employees | □ |
| 7. Other reason (please specify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

## Part 2 - Downward wage rigidity and the adjustment to shocks

**This part addresses the issue of the presence of (eventual) obstacles to downward wage adjustments and the reaction of firms to different shocks (including in this year in response to the economic crisis).**

**14 - Over the last five years, has the base wage of some workers in your firm ever been frozen (or are you currently planning to freeze it)?**

***Definition of freeze in base wage: the base wage remains unchanged in nominal terms from the moment of the last renegotiation of wages to the next renegotiation***

**You may choose more than one answer! The last two options are not mutually exclusive!**

| | |
|---|---|
| 1. No | □ |
| 2. Yes, we have frozen the base wage. | Indicate for what percentage of your employees _____ %<br>→If you choose this option, **continue with question 15 and then with question 16** |
| 3. Yes, we are planning to freeze the base wage. | □ → If you choose this option, **continue with question 15 and then with question 16** |

**15 - Over the last five years, has the base wage of some workers in your firm ever been cut (or are you currently planning to cut it)?**

***Definition of cut in base wage: the base wage is cut in nominal terms from the moment of the last renegotiation of wages to the next renegotiation***

**You may choose more than one answer! The last two options are not mutually exclusive!**

| | |
|---|---|
| 1. No | □ |
| 2. Yes, we have cut the base wage | Indicate for what percentage of your employees _____ %<br>→If you choose this option, **continue with question 16** |
| 3. Yes, we are planning to cut the base wage. | □ → If you choose this option, **continue with question 16** |

**16 - If yes in either 14 or 15, what was the main reason for freezing or cutting the base wage?**

**Please choose one answer, the most important reason!**

| | |
|---|---|
| 1. Profitability and/or sales went down | □ |
| 2. Other costs increased | □ |
| 3. Jobs were at risk | □ |
| 4. It was imposed by legislation or higher level collective agreement | □ |
| 5. Because the worker performance was not satisfactory | □ |
| 6. Other (please specify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**17 - How relevant are the following reasons in preventing base wage cuts?**

**Please give one answer on each row!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. It is impeded by labour regulation/collective agreements | 1 | 2 | 3 | 4 | 5 |
| 2. It would have a negative impact on employees' efforts | 1 | 2 | 3 | 4 | 5 |
| 3. It would have a negative impact on employees' morale | 1 | 2 | 3 | 4 | 5 |
| 4. It would have a negative impact on the firm's reputation | 1 | 2 | 3 | 4 | 5 |
| 5. It would mean the best employees would leave the firm | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| 6. It would imply high costs of hiring and training new employees | 1 | 2 | 3 | 4 | 5 |
| 7. It would create difficulties in attracting new workers | 1 | 2 | 3 | 4 | 5 |
| 8. Workers dislike unpredictable reductions in income | 1 | 2 | 3 | 4 | 5 |
| 9. Employees are concerned with how their wage compares to that of similar workers in other firms in the same market | 1 | 2 | 3 | 4 | 5 |

**18 - Has any of the following strategies ever been used in your firm to reduce labour costs?**

***Definition of labor costs: wages, salaries, bonuses, costs for annual leave advances/ overtime work /seniority bonuses, social security contributions, indemnity payments, social benefits in cash or in kind, tax contributions, training costs***

**Please select all the options that apply to your firm!**

| | |
|---|---|
| 1. Recruitment of new employees (with similar skills and experience) at lower wage than those who left (e.g due to voluntary quits and retirement) | □ |
| 2. Use of early retirement to replace high wage employees by entrants with lower wages | □ |
| 3. Reduction or elimination of bonus payments | □ |
| 4. Reduction or elimination non pay benefits | □ |
| 5. Change in shift assignments | □ |
| 6. Slowdown or freeze of the rate at which promotions are filled | □ |
| 7. None of them | □ |
| 8. Other (please specify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**19 - Has it become easier over the last decade to adjust wages to reduce labour costs?**

**Please choose one answer!**

| | |
|---|---|
| 1. Yes | □ →if you choose this option, **continue with question 20** |
| 2. No | □ → if you choose this option, **continue with question 21** |
| 3. Do not know | □ → if you choose this option, **continue with question 21** |

**20 - If yes, why ?**

**Please choose one answer, the most important reason!**

| | |
|---|---|
| 1. Competition has become more intense | □ |
| 2. There is larger availability of workers on the market | □ |
| 3. Trade unions have less power in collective bargaining | □ |
| 4. Market regulation has become less tight | □ |
| 5. Production is outsourced in markets where labour is cheaper | □ |
| 6. Price inflation and inflation expectations are lower and more stable | □ |
| 7. Other (please sepcify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**Part 3 – Reaction to shocks**

**The next questions investigate how your firm adjusts wages, prices, total costs, employment and margins to shocks (including in the current year in response to the economic crisis).**

**In answering, for <u>prices</u> you should think of the "main product or service, defined as the one that generated the highest fraction of turnover in 2008, and for <u>employment and wages</u> to the main occupational group in your firm (as identified in question 1).**

**21 – How does your firm react to an unanticipated (significant) slowdown in demand ?**

**Please <u>tick a box for each line</u>!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. Increase prices | 1 | 2 | 3 | 4 | 5 |
| 2. Reduce margins | 1 | 2 | 3 | 4 | 5 |
| 3. Reduce input | 1 | 2 | 3 | 4 | 5 |
| 4. Reduce costs | 1 | 2 | 3 | 4 | 5 |

**22 – If the reduction of costs is of any relevance in your answer to question 21, please indicate the main channel through which this goal is achieved:**

**Please choose <u>one answer, the most important reason</u>!**

| | |
|---|---|
| 1. Reduce base wages | □ |
| 2. Reduce flexible wage components (for example bonuses, benefits, etc.) | □ |
| 3. Reduce the number of regular employees | □ |
| 4. Reduce the number of temporary employees / other type of workers | □ |
| 5. Adjust the number of hours worked per employee | □ |
| 6. Reduce non-labour costs (for example) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**23 – How does your firm react to an unanticipated (significant) increase in the cost of an intermediate input (e.g. an oil price increase) affecting all firms in the market?**

**Please <u>tick a box for each line</u>!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. Increase prices | 1 | 2 | 3 | 4 | 5 |
| 2. Reduce margins | 1 | 2 | 3 | 4 | 5 |
| 3. Reduce output | 1 | 2 | 3 | 4 | 5 |
| 4. Reduce other costs | 1 | 2 | 3 | 4 | 5 |

**24 - If the reduction of other costs is of any relevance in your answer to question 23, please indicate the main channel through which this goal is achieved:**

**Please choose one answer, the most important reason!**

| | |
|---|---|
| 1. Reduce base wages | □ |
| 2. Reduce flexible wage components (for example bonuses, benefits, etc ) | □ |
| 3. Reduce the number of regular employees | □ |
| 4. Reduce the number of temporary employees / other type of workers | □ |
| 5. Adjust the number of hours worked per employee | □ |
| 6. Reduce non-labour costs (for example) _____ _ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**25 - How does your firm react to an unanticipated permanent increase in wages (e.g. due to an increase in the minimum wage) affecting all firms in the market?**

**Please tick a box for each line!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. Increase prices | 1 | 2 | 3 | 4 | 5 |
| 2. Reduce margins | 1 | 2 | 3 | 4 | 5 |
| 3. Reduce output | 1 | 2 | 3 | 4 | 5 |
| 4. Reduce other costs | 1 | 2 | 3 | 4 | 5 |

**26 - If the reduction of other costs is of any relevance in your answer to question 25, please indicate the main channel through which this goal is achieved:**

**Please choose one answer, the most important reason!**

| | |
|---|---|
| 1. Reduce flexible wage components (for example bonuses, benefits, etc) | □ |
| 2. Reduce the number of regular employees | □ |
| 3. Reduce the number of temporary employees / other type of workers | □ |
| 4. Adjust the number of hours worked per employee | □ |
| 5. Reduce other non-labour costs (for example) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |

**27 - How does your firm react to an unanticipated (significant) increase in demand ?**

**Please tick a box for each line!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. Increase prices | 1 | 2 | 3 | 4 | 5 |
| 2. Hire more people and/or do more overtime | 1 | 2 | 3 | 4 | 5 |
| 3. Increase investment and/or buy new facilities | 1 | 2 | 3 | 4 | 5 |
| 4. Reduce inventory rather than raising output | 1 | 2 | 3 | 4 | 5 |
| 5. Other measures such as _____ | 1 | 2 | 3 | 4 | 5 |

**28 – How does your firm react to an unanticipated (significant) decrease in the cost of an intermediate input (e.g. decrease in the price of raw materials, decrease in fuel prices)?**

**Please tick a box for each line!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. Reduce prices | 1 | 2 | 3 | 4 | 5 |
| 2. Increase profit margins | 1 | 2 | 3 | 4 | 5 |
| 3. Increase output | 1 | 2 | 3 | 4 | 5 |
| 4. Other (please specify) _____ | 1 | 2 | 3 | 4 | 5 |

**29 – If your firm undertakes changes in prices in the case of one or all of the changes in the external environment stated below, how much time passes before that change in prices takes place?**

**Please tick a box for each line!**

| *Change in the external environment* | *Time period for undertaking change in prices* |
|---|---|
| 1. Decrease in demand | In:<br>1. week(s) – specify a number …….<br>2. month(s) – specify a number ……<br>3. prices are not changed □ |
| 2. Increase in demand | In:<br>1. week(s) – specify a number …….<br>2. month(s) – specify a number ……<br>3. prices are not changed □ |
| 3. Decrease in the cost of an intermediate input | In:<br>1. week(s) – specify a number …….<br>2. month(s) – specify a number ……<br>3. prices are not changed □ |
| 4. Increase in the cost of an intermediate input | In:<br>1. week(s) – specify a number …….<br>2. month(s) – specify a number ……<br>3. prices are not changed □ |

| Part 4 - Price setting and price changes | |
|---|---|
| **This part collects some information on price setting and the frequency of price changes. The price should refer to the firm's "main product or service", defined as the one that generated the highest fraction of the firm's revenue/turnover in 2008. The main market should refer to the market that generated the highest fraction of revenues from sales of your main product or service.** | |
| **30 - What share of the revenue generated by your firm's main product or service in 2008 was due to sales on:** | |
| 1. Domestic market | _____ % |
| 2. Foreign markets | _____ % |
| Total ( = 100%) | 100 % |
| **31 - What is your market share on your main market?** | |
| 1. 0% - 5% | □ |
| 2. 6% - 20% | □ |
| 3. 21% - 50% | □ |
| 4. Over 50% | □ |
| 5. I do not know | □ |
| 6. It does not apply | □ |
| **32 - How is the price of your firm's main product or service set on its main market?**<br>**Please choose <u>one answer</u>!** | |
| There is not an autonomous price setting policy because | |
| 1. the price is regulated, or it is set by a parent company / group | □ |
| 2. the price is set by the main customer(s) | □ |
| 3. The price is set following the main competitors | □ |
| 4. The price is set fully according to costs and a completely self-determined profit margin | □ |
| 5. Other (please specify) _____ | □ |
| **33 - To what extent does your firm experience price competition for its main product or service?**<br>**Please choose <u>one answer</u>!** | |
| 1. Severe competition | □ |
| 2. Strong competition | □ |
| 3. Weak competition | □ |
| 4. No competition | □ |
| 5. Don't know / no answer | □ |
| **34 - Suppose that the main competitor for your firm's main product decreases its prices; how likely is your firm to react by decreasing its own price?**<br>**Please choose <u>one answer</u>!** | |
| 1. Very likely | □ |
| 2. Likely | □ |
| 3. Not likely | □ |
| 4. Not at all | □ |
| 5. It does not apply | □ |
| **35 - In case your firm is a member of a sectoral /branch organization, do you consider the pricing policy of the other members of the organization when taking decisions about your prices?** | |
| 1. Yes | □ |
| 2. No | □ |
| 3. It does not apply | □ |

**36 – Under normal circumstances, how often is the price of the firm's main product or service generally changed?**

**Please select <u>only one</u> of the options below, the one that applies most closely to your firm!**

| | |
|---|---|
| 1. daily | □ |
| 2. weekly | □ |
| 3. monthly | □ |
| 4. quarterly | □ |
| 5. half-yearly | □ |
| 6. Once a year | □ |
| 7. Once every two years | □ |
| 8. Less frequently than once every two years | □ |
| 9. Never | □ |
| 10. There is not a defined pattern | □ |

**37 – Under normal circumstances, are these price changes concentrated in any particular month / months?**

1. No □

Yes:

| | |
|---|---|
| 2. January □ | 8. July □ |
| 3. February □ | 9. August □ |
| 4. March □ | 10. September □ |
| 5. April □ | 11. October □ |
| 6. May □ | 12. Ноември □ |
| 7. June □ | 13. Декември □ |

**38 – How does the timing of these price changes relate to that of wage changes ?**

**Please choose <u>one answer</u>!**

| | |
|---|---|
| 1. There is no link between the two | □ |
| 2. There is a link but no particular pattern | □ |
| 3. Decisions are taken simultaneously | □ |
| 4. Price changes tend to follow wage changes | □ |
| 5. Wage changes tend to follow price changes | □ |
| 6. Other (please specify) _____ | □ If you have chosen this option, please **specify at the empty row in the column to the left** |
| 7. I do not know | □ |

**39 – What is the importance of the factors listed below in terms of a price increase decision?**

**Please tick a box for each line!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. An increase in wage costs | 1 | 2 | 3 | 4 | 5 |
| 2. An increase in capital (loan interest) costs | 1 | 2 | 3 | 4 | 5 |
| 3. Higher prices of purchased goods and services or raw materials | 1 | 2 | 3 | 4 | 5 |
| 4. Improved quality of our main product | 1 | 2 | 3 | 4 | 5 |
| 5. Our competitors raised their prices | 1 | 2 | 3 | 4 | 5 |
| 6. Rising demand of our main product or service | 1 | 2 | 3 | 4 | 5 |
| 7. A public agency (e.g. a price regulator) authorised a higher price | 1 | 2 | 3 | 4 | 5 |
| 8. We link our price to the general price level (indexation) | 1 | 2 | 3 | 4 | 5 |
| 9. Forecasts on inflation and/or business activity have changed | 1 | 2 | 3 | 4 | 5 |
| 10. Other (please specify) _____ | 1 | 2 | 3 | 4 | 5 |

**40 – What is the importance of the factors listed below in terms of a price decrease decision?**

**Please tick a box for each line!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. A decrease in wage costs | 1 | 2 | 3 | 4 | 5 |
| 2. A decrease in capital (loan interest) costs | 1 | 2 | 3 | 4 | 5 |
| 3. Lower prices of purchased goods and services or raw materials | 1 | 2 | 3 | 4 | 5 |
| 4. We improved our productivity | 1 | 2 | 3 | 4 | 5 |
| 5. Our competitors lowered their prices | 1 | 2 | 3 | 4 | 5 |
| 6. Falling (contracting) demand of our main product or service | 1 | 2 | 3 | 4 | 5 |
| 7. A public agency (e.g. a price regulator) called for a lower price | 1 | 2 | 3 | 4 | 5 |
| 8. We link our price to the general price level (indexation) | 1 | 2 | 3 | 4 | 5 |
| 9. Forecasts on inflation and/or business activity have changed | 1 | 2 | 3 | 4 | 5 |
| 10. Other (please specify) _____ | 1 | 2 | 3 | 4 | 5 |

**41 – If there are reasons to raise or reduce the price of your main product or service, which of the following factors might prevent such a price change?**

**Please tick a box for each line!**

| | *not relevant* | *of little relevance* | *relevant* | *very relevant* | *don't know* |
|---|---|---|---|---|---|
| 1. Concerns that our competitors will not change their prices | 1 | 2 | 3 | 4 | 5 |
| 2. The concern that we subsequently will have to readjust the price in the opposite direction | 1 | 2 | 3 | 4 | 5 |
| 3. We have arrangements with our customers, in which we guarantee to offer our main product at a specific price and that price may be changed only after a rearrangement of our contract terms | 1 | 2 | 3 | 4 | 5 |
| 4. We would like to maintain the good relationship with our regular customers (even if we do not have formal arrangements with them) | 1 | 2 | 3 | 4 | 5 |
| 5. The price we used up to now was a psychological price (e.g. 9.99); we would change that price only if the new price were also a psychological one | 1 | 2 | 3 | 4 | 5 |
| 6. Changing prices entails costs (e.g. related to printing new price lists or catalogues, modifying our website, readjusting our computer system, etc.) | 1 | 2 | 3 | 4 | 5 |
| 7. Other (please specify) _____ | 1 | 2 | 3 | 4 | 5 |

**42 – What share of your firm's revenues generated by your main product or service on your main market in 2008 is due to sales to partners with whom you have long-term contracts?**

| | |
|---|---|
| 1. Specify an answer in % | _____% |
| 998. I do not know | □ |
| 999. It does not apply | □ |

**43 – What share of your firm's revenues in 2008 generated by your main product or service on your main market is due to sales to:**

| | |
|---|---|
| 1. Wholesalers | _____ % |
| 2. Retailers | _____ % |
| 3. Within the corporate group | _____ % |
| 4. Other companies | _____ % |
| 5. The government | _____ % |
| 6. To consumers (directly, through catalogues, or by Internet) | _____ % |
| Other channels (such as) _____ | _____ % |
| TOTAL (=100%) | 100% |

**Part 5 – Additional questions on the reaction to the current economic downturn**

**44 – To what extent is your firm's activity (in terms of turnover) affected by the current economic and financial crisis?**

**Please choose one answer!**

Negatively affected (please specify):

1. marginally □
2. moderately □
3. strongly □
4. exceptionally strongly □

5. Positively affected □
6. Not at all □

**45 – To what extent is the current economic and financial crisis affecting your firm with respect to each of the following aspects?**

**Please select an option for each line!**

| | *Not at all/ marginally* | *moderately* | *strongly* | *exceptionally strongly* | *don't know* |
|---|---|---|---|---|---|
| 1. Fall in the demand for your firm's products/services | 1 | 2 | 3 | 4 | 5 |
| 2. Difficulty in financing your firm's activity through the usual financial channels | 1 | 2 | 3 | 4 | 5 |
| 3. Difficulty in being paid by customers | 1 | 2 | 3 | 4 | 5 |
| 4. Difficulty in obtaining intermediate products from your firm's usual suppliers | 1 | 2 | 3 | 4 | 5 |

**46 – In the current economic and financial crisis is your firm benefiting from government measures aimed at avoiding loss of workers or wage cuts?**

1. No □
2. Yes □ (Please specify) _____

**Part 6 – Information about the firm**

**47 – Number of workers (including employees and other types of workers) that your firm had at the end of 2008:**

***Definitions:***
***PERMANENT FULL-TIME (ARTICLE 136 OF THE LABOR CODE)***
***PERMANENT PART-TIME (ARTICLE 138 OF THE LABOR CODE)***
***TEMPORARY (TEMPORARY LABOR CONTRACT (ARTICLE. 67. (1) POINT1 OF THE LABOR CODE) AND LABOR CONTRACT FOR A PROBATION PERIOD (ARTICLE 70 OF THE LABOR CODE))***

1. Number of employees _____

| Of which: **(please fill in one of the two columns – number or % according to your preference)** | Per cent | Number |
|---|---|---|
| 2. Permanent full-time | _____ % | _____ |
| 3. Permanent part-time | _____ % | _____ |
| 4. Temporary | _____ % | _____ |
| **TOTAL ( = 100%)** | **100 %** | |
| 5. Number of other types of workers (e.g. people employed by agencies, consultants, apprenticeships, students, etc.) | | Number _____ |

**48 – Number of employees that left the firm in 2008 :**

**(refers to all types of employees: *permanent full-time, permanent part-time, temporary*)**

_____ (Please specify an exact or an approximate number)

**49 – Number of employees that joined the firm in 2008 :**

**(refers to all types of employees: *permanent full-time, permanent part-time, temporary*)**

_____ (Please specify an exact or an approximate number)

**50 – Distribution of the firm's employees by age at the end of 2008 :**

| | |
|---|---|
| 1. Less than 24 | _____ % |
| 2. 24-54 | _____ % |
| 3. 55-65 | _____ % |
| 4. Over 65 | _____ % |
| TOTAL ( = 100%) | 100 % |

**51 – Distribution of the firm's permanent employees according to tenure at the end of 2008:**

| | |
|---|---|
| 1. Less than 1 year | _____ % |
| 2. Between 1 and 5 years | _____ % |
| 3. More than 5 years | _____ % |
| TOTAL ( = 100%) | 100 % |

**52 – First year of operation of your firm:**

_____

**53 – What percentage of your firm's total costs were due to labor costs in 2008?**

_____ %

**54 – In which of the following groups does your firm belong to, based on the annual net revenues from sales in 2008 ?**

| | |
|---|---|
| 1. up to BGN 1 000 000 | □ |
| 2. from BGN 1 000 001 to BGN 5 000 000 | □ |
| 3. from BGN 5 000 001 to BGN 10 000 000 | □ |
| 4. over BGN 10 000 000 | □ |
| 5. I do not want to answer | □ |

**55 – Full name of the firm :**

_____

**56 – Main scope of activity of the firm :**

_____ (Please describe as detailed as possible)

56.1. Code based on the National Classification of Economic Activities _____

**57 – Please write down (even roughly) how much time did it take you to complete the questionnaire:**

_____ (Please specify in number of minutes)

DP/95/2014

# Фактори на кредитната динамика извън еврозоната

Петър Пешев

Резюме. В настоящата разработка се анализират факторите на търсенето и предлагането на кредити в страните от ЕС, които към края на 2012 г. не са част от еврозоната. Чрез инструментариума на дескриптивния анализ и на емпиричния анализ на времеви редове се извеждат детерминантите на търсене и предлагане на кредити в България, Великобритания, Дания, Латвия, Литва, Полша, Румъния, Унгария, Чехия и Швеция през периода 2008–2012 г., като се акцентира върху страните от ЦИЕ. Анализът отчита различията между десетте държави, но като основен фактор за търсенето на кредити и за кредитната динамика като цяло се очертава икономическата активност. в края на разглеждания период търговските банки са по-добре капитализирани и по-ликвидни, но кредитирането остава в депресивно състояние. Икономическата активност влияе върху банковите баланси чрез динамиката на необслужваните кредити, а оттам тя въздейства и върху поведението на търговските банки, респ. върху предлагането на кредити.

Abstract. This paper analyzes the factors of credit demand and supply in EU countries that are not part of the euro area as of the end of 2012. Combining the methods of descriptive analysis and empirical time series analysis determines the factors of loan demand and supply in Bulgaria, the United Kingdom, Denmark, Latvia, Lithuania, Poland, Romania, Hungary, Czech Republic and Sweden in the period 2008–2012, with an accent on the CEE countries. The analysis takes into account the differences between the ten countries, but as a major factor of credit demand and overall credit dynamics, economic activity is generally outlined. At the end of the reporting period, commercial banks were better capitalized and more liquid, but lending remained in a depressed state. Economic activity influences bank balances through the dynamics of non-performing loans, and hence it also affects the behavior of commercial banks, respectively on the supply side.

Авторът е докторант в УНСС. Темата е разработена от него като стипендиант на БНБ за 2013 г. по Програмата за стипендианти на БНБ.

## Съдържание

## Въведение

В периода преди последната глобална финансова и икономическа криза страните – членки на ЕС, които не са част от Икономическия и паричен съюз, преминават през фаза на висок икономически растеж. През периода 2004–2008 г. БВП нараства годишно средно с 5.7% в България, Унгария, Литва, Полша, Румъния и Чехия, докато във Великобритания, Дания, Латвия и Швеция кризата се отразява силно върху икономиката още през 2008 г., като съвкупното им годишно производство нараства средно с 4.8% в периода 2004–2007 г.

Съотношението „вътрешен кредит/БВП" съответства средно на 142% от БВП за Великобритания, Дания и Швеция през 2004 г. и на 39% на седемте страни от ЦИЕ, докато към края на 2008 г. индикаторът нараства до 186% за трите най-развити страни и до 66% за седемте страни от ЦИЕ. Със 7% средногодишно (геометрична средна) се увеличава кредитът в трите най-развити страни и с 14% в страните от ЦИЕ. Румъния и Литва са лидери, съответно с 29% и 20% средногодишен темп на нарастване, докато кредитирането се увеличава с по-бавни темпове в Швеция и Дания, съответно с 5.6% и 6.2%. Засилването на финансовото посредничество благоприятства за възходящата икономическа динамика, като двуцифреният темп на увеличение на съотношението „кредити/БВП" в страните от ЦИЕ се определя като нормален процес на догонване с оглед на ниската начална база.[1] Разбира се, бързият икономически растеж, високата инфлация, големите входящи капиталови потоци, дефицитите по текущата сметка, нарастващата с бързи темпове кредитна динамика, външната и вътрешната задлъжнялост сигнализират за прегряване на икономиките и за формиране на вътрешно- и външноикономически дисбаланси.

Именно кризата разкрива размера на формираните дисбаланси, като засяга сериозно икономиките и финансовите системи на България, Великобритания, Дания, Латвия, Литва, Полша, Румъния, Унгария, Чехия и Швеция, макар че някои от тях се справят с предизвикателствата далеч по-добре от други. В част от разглежданите страни спадът на реалния БВП през пиковата за кризата 2009 г. превишава 10%, а съотношението

[1] Вж. Erdinç, 2009.

между необслужваните кредити и брутния размер на кредитите постепенно нараства от под 3% средно за десетте страни до над 16% през 2012 г. Централните банки и правителствата предприемат нетрадиционни мерки за нормализиране дейността на банковия пазар, като понижаване на лихвите до исторически минимуми, предоставяне на по-дългосрочно финансиране на търговските банки, разширяване на кръга от финансови инструменти, приемани като обезпечения по репо финансирането, правителствени вложения в банкови капиталови книжа, програми по изкупуване на активи и на такива по гарантиране на активи и пасиви и др. След 2008 г. се наблюдава силен растеж на депозитите, капитала, ликвидността и необслужваните кредити в банковата система, докато кредитите нарастват минимално в номинално изражение, а като дял от банковите активи дори се понижават. Търговските банки увеличават ликвидните и капиталовите си буфери, но те не се прехвърлят към реалната икономика посредством кредити с такъв темп, който да е достатъчен за стимулиране на индивидуалното потребление и инвестициите, а оттам и на икономическия растеж.

Динамиката на производството, заетостта, цените, лихвените проценти, входящите и изходящите капитали, външнотърговския поток на стоки и услуги, публичните финанси, както и на показателите, базирани на статии от банковите баланси, са сред променливите, обясняващи дисперсията в кредитните агрегати през периода 2008–2012 г. Политиките на фискалните и монетарните власти също оказват влияние върху тази дисперсия. В период на шоково сътресение във финансовия сектор и в икономиката като цяло е изключително трудно да се изолират факторите на кредитната динамика и поради това, че изменението на кредитните агрегати зависи едновременно от фактори на търсенето и предлагането на кредити.

Това предизвикателство е още по-голямо при изследване на страните – членки на ЕС, които не са част от ИПС. По своята степен на икономическо развитие Великобритания, Дания и Швеция превъзхождат останалите седем държави, сред които също има значителни различия въпреки тяхната географска принадлежност към региона на ЦИЕ и общата им съдба на икономики в преход. Друга съществена разлика е, че страни като България, Дания,

Латвия и Литва са с режим на фиксиран валутен курс[2], което силно ограничава политиката на техните ЦБ. Посочените страни могат да бъдат групирани по много социално-икономически признаци – например размер на икономиката, численост на населението, възрастова структура на населението, значимост на кредитите за икономиката и др.

Добре функциониращите финансови пазари, в които търговските банки често заемат основно място, са необходимото и задължително условие за развитието на съвременната икономика. Кредитирането насърчава натрупването на капитал и технологичните иновации и по този начин стимулира икономическата активност. В съвременната икономика до голяма степен банките решават кои проекти да бъдат реализирани посредством процеса на кредитиране (вж. Minsky, 1992). Schumpeter (1946) дори определя кредитите като необходимо условие за по-добро бъдеще, а Keynes (1936/ed.1997) твърди, че са нужното средство икономиката да се движи с по-висока скорост. Поради тези причини и заради нарастващото значение на кредитите за икономиката е много важно да се изследват факторите, които обуславят кредитната динамика.

Обект на изследване в настоящия анализ е кредитният пазар в страните – членки на ЕС, които са извън еврозоната към края на 2012 г. (България, Великобритания, Дания, Латвия, Литва, Полша, Румъния, Унгария, Чехия, Швеция), с акцент върху страните от ЦИЕ. Предмет на изследването са факторите, влияещи върху частния кредит[3] през 2008–2012 г. Целта на изследването е да се изведат факторите на търсенето и предлагането на кредити през посочения период.

Първоначално в изследването се представят основни резултати от съществуващи емпирични изследвания на фактическото обуславяне на кредита. Последващият етап включва дескриптивен анализ на факторите на търсенето и

[2] В България и Литва функционира режим на паричен съвет, докато в Латвия действа фиксиран валутнокурсов режим без допълнителните рестрикции, които валутният борд предполага. Като цяло валутнокурсовите режими в трите страни са подобни, като се има предвид, че паричната политика на ЦБ е силно ограничена и поради факта, че е необходимо поддържането на международни валутни резерви, които да гарантират фиксирания валутен курс. Латвия, Литва и Дания са част от Валутния механизъм II (*ERMII*), като имат задължение да поддържат фиксиран курса на националните си валути спрямо еврото с допустимо отклонение от +/-2.5%.

[3] Под „частен кредит" да се разбират кредитите на фирмите от нефинансовия сектор и домакинствата.

предлагането на кредити за всички страни и отделно за България. Накрая за избрани страни е направено и иконометрично оценяване на функциите на търсене и предлагане на кредити, като по този начин се извеждат факторите на кредитната динамика.

## Фактори на кредитната динамика в емпиричната литература

През последните две десетилетия научните изследвания, моделиращи емпирично търсенето и предлагането на кредити, нарастват прогресивно. Това е атестат за научния и приложния аспект на проблематиката, както и цялостно – за важността ѝ. Растящият брой на публикациите е показателен за трудността за намирането на единен подход на изследване, който да доведе до общовалидни резултати.

Най-общо емпиричните изследвания могат да бъдат групирани по следния начин: 1) с фокус върху търсенето на кредити; 2) с акцент върху предлагането, и 3) обхващащи едновременно функциите на търсенето и предлагането на кредити. Изследванията също могат да бъдат разделени според целта: извеждане на търсенето и предлагането на частния кредит (заедно и поотделно); моделиране на кредита за домакинствата и фирмите (заедно и поотделно), както и проучване на факторите на вътрешния, общия или публичния кредит. Може да се направи деление на емпиричните изследвания и на база използваните иконометрични методи, както и по редица други признаци (географски, ниво на агрегация, панелни или индивидуални данни и др.).

Сред пионерите в емпиричното моделиране на кредитите с цел извеждане на факторите за тяхната динамика могат да бъдат определени Bernanke and Blinder (1988) с тяхното изследване „Кредит, пари и съвкупно търсене". В него търсенето на кредити зависи положително от реалния БВП, от лаговата стойност на кредита и от равнището на цените, докато лихвеният марж (лихвите по кредитите минус лихвите по тримесечните съкровищни бонове) има отрицателно значение за неговата динамика. При извеждане на факторите на търсенето на кредити и икономическата активност традиционно се доказва, че тази връзка е права, т.е. налице е процикличност спрямо икономическата динамика. Права е връзката също между миналата и сегашната стойност на кредита, т.е. налице е процикличност спрямо собствената му стойност.

В изследванията, разглеждащи факторите на търсенето на кредити, се очертават две най-често срещани променливи, които с висока степен на вероятност обясняват кредитната динамика – БВП, или негова производна, и лихвите по кредитите. В кредитното уравнение знакът на първата променлива е положителен, а на втората – отрицателен[4]. Освен променлива за икономическа активност (БВП, БВП на човек от населението, БДС, инвестиции, промишлено производство) и цена на кредита (променлива за лихви по кредитите), нерядко се включват и редица други параметри, като често срещани са лаговите стойности на изследваната променлива и инфлацията (ИПЦ и в по-малка степен производствената инфлация). Положително може да е влиянието на инфлацията върху търсенето на кредити вероятно заради преразпределението на богатство от кредитор към длъжник.[5] Възможна е и хипотезата, че при нарастващи цени икономическите агенти търсят заемни средства, за да покрият своите планирани и извънредни разходи.

Инфлацията не се разглежда еднозначно при определяне детерминантите на кредитите, като тя може да е и с отрицателен знак в уравнението на кредитното търсене. Според Blundell-Wignall and Gizycki (1992) и Pazarbasioglu (1997) очакваните инвестиции оказват положително влияние върху търсенето на кредити, докато лихвите по кредитите и инфлацията му влияят отрицателно.[6] При покачващи се цени стопанските агенти ограничават търсенето на банкови кредити заради намаляване в реално изражение на разполагаемия доход (на домакинствата) и нетния паричен поток (на фирмите). Обслужването на кредитите и изплащането им става по-трудно, поради което е валидна хипотезата, че при покачващи се цени намалява търсенето на кредити. Друго възможно обяснение за възпиращия ефект на инфлацията върху търсенето на кредити е свързано с очакванията за спад в цените на стоките и услугите и

[4] За това свидетелстват резултатите и в изследванията на Hofmann (2001), Hülsewig et al. (2001), Qayyum (2002), Barajas and Steiner (2002), Христов и Михайлов (2002), Bruggeman and Donnay (2003), Galza et al. (2003), Takeda et al. (2003), Martínez – Carrascal and del Río (2004), De Bandt et al. (2006), Frömmel and Schmidt (2006), Gambacorta and Rossi (2007), Gattin -Turkalj et al. (2007), Egert et al. (2007), Frömmel and Karagyozova (2008), De Mello and Pisu (2009), Sørensen et al. (2009), Beck et al. (2012), Arestis and González (2013).

[5] Освен в редица от цитираните изследвания подобни са изводите и на Takeda et al. (2003).

[6] Вж. Hülsewig et al., 2001, Égert et al., 2007, De Mello and Pisu, 2009, Beck et al., 2012.

на факторите за тяхното производство след тяхното повишение, и обратно.

Към традиционните детерминанти, като БВП и лихвите по кредитите, Hofmann (2001) добавя и променлива за цената на имотите, която влияе положително върху търсенето на кредити. В този случай се проявява ефектът на богатството – икономическите агенти стават по-уверени поради поскъпване на обезпеченията по кредитите и в резултат от желанието да се притежава актив с повишаваща се стойност.[7] Цените на имотите[8] и цените на финансовите активи, в частност – капиталовите ценни книжа[9], са друга срещана група променливи, които най-често са с положителен принос за търсенето на кредити. Повишението в цените на активите увеличава нетната стойност на фирмите и домакинствата, т.е. увеличава увереността им и влияе положително върху търсенето на кредити.

Допълнителни факторни променливи на търсенето на кредити са вътрешните източници на финансиране. Логично е при увеличаване на вътрешните източници на финансиране да намалява търсенето на кредити, което се наблюдава и при намирането на алтернативи на банковото финансиране. Например паричните потоци от сливания и придобивания действат възпиращо на търсенето на кредити[10], така както поскъпващите акции дават възможност на компаниите да финансират дейността си чрез емисията на финансови инструменти.

Зависимата променлива в изследванията преобладаващо е фирменият или частният кредит (добавят се кредитите на домакинствата и нестопанските организации). Разработките, извеждащи банковите кредити на домакинствата, се осъществяват по-интензивно едва през последните години. Тенденцията навярно се дължи на факта, че в редица развити икономики делът на кредита за домакинствата в общия кредит превишава този за фирмите. Поведението на домакинствата и фирмите се определя от различни променливи, но с висока

[7] Обект на изследването на Hofmann (2001) е кредитът за нефинансовия частен сектор в 16 индустриални страни за периода 1980–1989 г.

[8] Вж. Hofmann, 2001, Gerlach and Peng, 2003, Martínez – Carrascal and del Río, 2004, De Bandt et al., 2006, Frömme and Karagyozova, 2008, Arestis and González, 2013.

[9] Вж. Blundell-Wignall and Gizycki, 1992, Barajas, 2002, Martínez – Carrascal and del Río, 2004, Arestis and González, 2013.

[10] Вж. Bruggeman and Donnay, 2003.

степен на увереност може да се твърди, че агрегирани величини за икономическата активност добре обясняват търсенето на кредити от бизнеса и от физическите лица. Ако поведението на домакинствата се влияе от доходите, данъците, потребителските цени, потребителските предпочитания, очакванията и задлъжнялостта, то поведението на фирмите е подвластно на динамиката на цените на производствените фактори, техническия прогрес, държавните регулации, пазарния дял, данъците и субсидиите и бизнес очакванията.

От детерминантите на предлагането на кредити се интересуват не само търговските банки, но и монетарните и икономическите власти, които трябва да предвиждат реакцията на банковата система в резултат на собствените им решения и политики. От кредитното поведение на банките в немалка степен зависи и икономическата активност в страната. За разлика от търсенето предлагането на кредити е в много по-голяма степен във функционална зависимост от политиката на ЦБ, която определя изискванията за капиталовата адекватност, ЗМР, изискванията за ликвидност, сроковете за класифициране на кредитните експозиции, операциите по покупко-продажба на активи, управлението на лихвените проценти – обект на пряк контрол на ЦБ. Предавателният механизъм на паричната политика дори се определя като черна кутия от Bernanke and Gertler (1995), които се опитват да я разкодират. Факторите за поведението на банките в опосредстване на получените средства към реалната икономика и до днес не са изведени еднозначно. Доказателство за това са изявленията на управителите на централните банки в САЩ, Англия, Япония, еврозоната, в които те признават, че въпреки влятата ликвидност в банковата система и капитализирането ѝ ТБ не кредитират със същия темп, с който се увеличават резервите им, т.е. усещането им за риск е нараснало, което се проявява в предпазливо предлагане на кредити[11].

Предлагането на кредити се влияе в най-голяма степен от специфични за банките променливи, като качеството на активите, структурата на активите и пасивите, коефициентите на капиталова адекватност, ликвидността и рентабилността, а в по-малка степен зависи от преките показатели за икономическата

[11] Вж. Draghi, 2012, Asmussen, (2012) – Протокол от заседанието по парична политика на японската централна банка (2012), Bernanke, 2008, Bernanke, 2012, Fischer, 2012.

активност, макар и банковите показатели да са добро отражение на случващото се в икономиката поради факта, че между реалния и финансовия сектор са налице сложни и често двупосочни зависимости. Със забавяне на икономическата активност нараства процентът на необслужваните кредити, респ. увеличават се провизиите за загуби от обезценка и се намалява собственият капитал. В резултат се влошават показателите за възвръщаемост и ефективност и се засилва нежеланието на ТБ да отпускат кредити.

В теоретичната част на своята статия Bernanke and Blinder (1988) извеждат предлагането на банкови кредити, което зависи в положителна степен от дела на кредитите в активите на банката и от свръхрезервите. Предлагането на кредити също е в права зависимост от лихвите по банковите кредити и в обратна зависимост от лихвите по облигациите, като последните са алтернативната цена на кредитите. Обратна е функционалната зависимост и спрямо включената променлива за риск.[12]

Емпиричните изследвания показват, че предлагането на кредити е в права зависимост от лихвите по кредитите и нетния лихвен марж или нетния лихвен доход и в обратна зависимост от инфлацията.[13] Само че и тук, както при търсенето на кредити, инфлацията може да се тълкува двояко. При растеж на цените банките може с охота да отпускат кредити. Банките оперират преобладаващо с привлечен ресурс, който също се обезценява в реално изражение при нарастване на ценовото равнище. Освен това при инфлация, предизвикана от търсенето, съществува по-голяма вероятност за изплащане на обезценяващите се в реално изражение дължими лихви и главници, т.е. намалява вероятността за нарастване на необслужваните кредити.[14] Те не са често срещана променлива за кредитната динамика. Необслужваните кредити по-скоро са изоставащ индикатор за ТБ, тъй като има определен срок, след който проблемните кредити се класифицират като необслужвани, а преди това да стане факт, често се правят опити за предоговарянето им. Тенденцията при необслужваните кредити обаче е показателна за оперативното и финансовото състояние на ТБ и за икономиката като цяло.

[12] Вж. Chinn, 2011.

[13] Вж. Blundell-Wignall and Gizycki, 1992, Pazarbasioglu, 1996, De Mello and Pisu, 2009.

[14] Инфлацията влияе положително върху предлагането на кредити в изследванията на Христов и Михайлов (2002), Guo and Stepanyan (2011), Alper et al. (2012).

Цените на имотите и финансовите активи са с положителен принос в уравнението на кредитното предлагане, тъй като са синоним на покачваща се стойност на обезпеченията по кредитите и на по-достъпно и разнообразно финансиране за банките.[15]

Друга група променливи се оказва с най-голям принос в уравнението на кредитното предлагане. Това са специфичните за банките балансови коефициенти, като ликвидност и производните ѝ, капиталова адекватност и производните ѝ.[16] Тази група променливи също може да се тълкува двояко, т.е. в някои изследвания те влияят положително върху предлагането на кредити, в други – отрицателно. При намаляването на икономическата активност и особено при спукването на ценови балони както в сектора на реалните активи, така и в сектора на финансовите активи, кредитирането се забавя или се свива и се наблюдава нарастване на съотношенията за капиталовата адекватност и ликвидност.[17] Тогава банките заемат защитна позиция и акумулират резерви поради очаквания за допълнително влошаване на икономическата конюнктура и за увеличение на необслужваните кредити. В обратния случай, когато икономиката е във възход, банките се чувстват уверени, увеличават дела на кредитите в активите си и намаляват капиталовата си адекватност и ликвидността си. Съществува и друг вариант – при позитивни очаквания за стопанската активност ТБ планират нарастване на кредитната си експозиция, което е съпроводено с поддържане на минимално заложеното ниво на капиталова адекватност, т.е. банките увеличават собствения капитал и дългово-капиталовите (хибридните) инструменти, които се включват в числителя на коефициентите за капиталова адекватност.

Пряк индикатор за риска в банковата система е и вариацията (волатилността) в цените на банковите акции. Налице е допускането, че на фондовите пазари се търгуват очаквания и силната промяна в цените на банковите корпоративни книжа е синоним на смяна в банковите и икономическите условия.[18]

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[15] Вж. Blundell-Wignall and Gizycki, 1992, Pazarbasioglu, 1996, Altunbas et al., 2009, Gambacorta and Marqués – Ibáñez, 2011.

[16] Вж. Blundell-Wignall and Gizycki, 1992, Hülsewig et al., 2001, Христов и Михайлов (2002), Takeda et al., 2003, Hurlin and Kierzenkowski, 2007, Altunbas et al., 2009, De Mello and Pisu, 2009, Cornett et al., 2010, Gambacorta and Marqués – Ibáñez, 2011, Alper et al., 2012, Montoro and Rojas-Suarez, 2012.

[17] Вж. Erdinç, 2009.

[18] Вж. Blundell-Wignall and Gizycki, 1992.

Осигуреността с депозити води до увеличаване на резервите, които могат да се трансформират в кредити или във финансови активи (основно ДЦК) в зависимост от усещането за риск на ТБ, т.е. растежът на депозитите е фактор за предлагането на кредити, но в условията на рецесия и финансова криза е синоним на заздравяване на ликвидните позиции на ТБ.[19]

## Дескриптивен анализ на детерминантите на кредитната динамика

Прегледът на емпиричната литература насочва към променливите, които следва да бъдат включени в дескриптивния анализ, както и към посоката и степента им на влияние върху изследваната величина – кредитите.[20] В настоящия раздел се разглежда динамиката на избрани икономически и банкови индикатори за отделните страни. За целите на дескриптивния анализ са използвани данни за страните – членки на ЕС, които са извън еврозоната, публикувани на интернет страницата на ЕЦБ, както и статистически данни на Световната банка и МВФ.[21] Тези променливи се интерпретират през призмата на значението им като фактори на търсенето и предлагането на кредити.

[19] Вж. Blundell-Wignall and Gizycki, 1992, Pazarbasioglu, 1996, Barajas et al., 2002, Hurlin and Kierzenkowski, 2007, Erdinç, 2009, Gambacorta, L. and D. Marqués – Ibáñez, 2011, Guo and Stepanyan, 2011.

[20] Ендогенни и екзогенни променливи (пояснение) – процесите в икономиката протичат в сложна взаимозависимост. Те са обусловени от множество фактори, като често се наблюдава наличието на двустранни връзки между дадена изследвана променлива и регресорите ѝ, т.е. изследваната величина може да причинява дисперсия в регресора ѝ. Именно на тази логика се базират векторните авторегресионни (VAR) модели, при които чрез система от уравнения всички променливи са ендогенни и освен от другите променливи са функция и от собствената си лагова стойност (вж. Sims, 1980).

От тази гледна точка променливите: БВП, съотношенията кредити към депозити, капитал към активи, ликвидни активи към активи, лихви по кредити, ценово равнище, външна задлъжнялост, външна търговия и международно движение на капитали и др., могат да се включват добре в обясняването на дисперсията на изследваната величина. До известна степен тяхната собствена дисперсия може да е предизвикана от дисперсията в изследваната променлива, т.е. не се изключва двустранна каузалност.

С оглед на това пояснения следва да се има предвид, че в текста за факторите на търсене и предлагане на кредити може да се използват взаимозаменяемо понятия като екзогенни променливи, обясняващи променливи и регресори. Това не означава, че променливите в дясната част на уравненията на търсене и предлагане на кредити не могат да бъдат зависими от изследваната величина, т.е. зависими от кредитите.

[21] ЕЦБ – Non-euro area EU countries, excluding the NCBs, МВФ – IMF World Economic Outlook Database April 2013, СБ – World Bank.

Стойностите на показателите за стопанска активност, лихвени равнища, цени, външен сектор и банковите индикатори свидетелстват за наличието на структурно прекъсване, предизвикано от международната финансова криза, която бързо се прехвърля в отворените икономики на изследваните страни.

Страните – членки на ЕС, които не са част от еврозоната, се различават значително помежду си. Значението на кредита за икономиката, измерено като съотношение на частния кредит към БВП за 2012 г., превишава 130% в Дания, Великобритания и Швеция, докато за останалите страни това съотношение е в диапазона от 39% до 71%. Освен с развита банкова система Великобритания, Дания и Швеция се отличават и с развито посредничество на капиталовите, застрахователните и осигурителните услуги.

Различия се наблюдават още в доходите на човек от населението, в степента на публична задлъжнялост, в нивата на преразпределение на БВП чрез публичните разходи, в размерите на годишното бюджетно салдо и в значението на външния сектор за икономиката (нетен износ, брутен външен дълг). Въпреки изброените различия развитието на банковите системи и икономики на 10-те държави показва редица общи тенденции. Общовалиден за всички тях е фактът, че банковите системи на национално ниво са силно зависими от дисперсията в движението на международния капитал, т.е. финансовите им системи и икономики са до голяма степен интернационализирани, докато институциите, които могат да оказват контрол върху паричния и правителствения сектор, са тясно национални и силно ограничени във възможността си за реакция при негативно развитие.[22] В тази логическа линия е редно да се спомене и фактът, че банковата приватизация в страните от ЦИЕ, освен до ноу-хау, води до навлизането на чуждестранния капитал, осигурен или гарантиран от банковите централи. Тази вълна от придобивания има силен сигнален ефект за привличането на международен капитал с източник, различен от банките майки. Входящите финансови капитали се трансформират в силно чувствителна на международни и локални шокове външна задлъжнялост и дефицит по текущата сметка в голяма част от разглежданите страни.

[22] Икономиките на десетте страни са интернационализирани по линия на външната търговия, движението на капитали и външната задлъжнялост.

Таблица 1

**ИЗМЕНЕНИЕ НА ИЗБРАНИ ПРОМЕНЛИВИ ПРЕЗ 2008–2012 Г.**

(%)

| СРЕДНОГЕОМЕТРИЧЕН ТЕМП НА НАРАСТВАНЕ | BG | CZ | DK | HU | LT | LV | PL | RO | SE | UK |
|---|---|---|---|---|---|---|---|---|---|---|
| Общо кредити | 4.0 | 5.6 | 1.5 | -4.5 | -3.8 | -6.5 | 9.4 | -2.1 | 8.9 | 5.0 |
| Кредити на нефинансовия частен сектор | 2.8 | 4.8 | -0.6 | -6.0 | -5.4 | -8.3 | 8.1 | 0.8 | 10.8 | 2.2 |
| Некапиталови ценни книжа | 11.3 | 12.9 | 6.9 | 8.0 | 10.7 | -17.4 | 10.3 | 53.8 | 2.8 | -5.4 |
| Парични средства и др. активи | 13.6 | -4.6 | -1.6 | - | 8.4 | 5.0 | -6.6 | -6.9 | -1.4 | -2.4 |
| Външни активи | 7.0 | -0.7 | -4.3 | -8.7 | 0.1 | 6.7 | -3.6 | 10.6 | 8.7 | 0.7 |
| Общо активи | 5.4 | 5.1 | 1.5 | -3.4 | -2.1 | -3.1 | 7.8 | 1.9 | 7.5 | 2.3 |
| Общо депозити | 7.9 | 6.8 | -0.9 | 0.0 | 5.9 | -0.8 | 8.5 | 4.3 | 6.1 | 5.0 |
| Депозити на нефинансовия частен сектор | 8.7 | 5.9 | 0.4 | -0.5 | 5.7 | 3.1 | 9.8 | 4.1 | 12.9 | 5.7 |
| Капитал и резерви | 7.8 | 10.9 | 0.3 | 1.6 | 10.0 | 3.0 | 15.3 | 16.2 | 14.5 | 13.6 |
| Външни пасиви | -7.4 | -4.4 | -2.5 | -11.6 | -13.6 | -6.4 | 3.4 | -4.8 | 1.6 | -1.1 |
| БВП, по цени от 2005 г. | -0.7 | -0.4 | -0.9 | -1.4 | -1.3 | -2.5 | 3.0 | -1.1 | 1.4 | -0.3 |
| Външни пасиви/активи | -12.2 | -9.0 | -3.9 | -3.3 | -8.5 | -11.8 | -3.4 | -4.1 | -6.6 | -5.5 |
| Кредити за частния нефинансовия сектор/активи | -2.4 | -0.3 | -2.1 | -2.8 | -3.4 | -5.4 | 0.3 | -1.1 | 3.1 | -0.1 |

Източници: ЕЦБ, собствени изчисления.

### *Фактори на търсенето на кредити*

Откроява се фактът, че страните с положителен икономически растеж в периода 2008–2012 г. отчитат и кредитен растеж, докато в страните с отрицателен прираст на БВП нарастването на кредитите се забавя, а в някои случаи кредитите намаляват, т.е. налице е положителна корелация. Средногодишно кредитите в Полша и Швеция нарастват с 8.1% и 10.8%, докато реалният БВП нараства съответно с 3% и 1.4%. В същото време страните с най-голям спад в производството регистрират най-голям спад на частния нефинансов кредит, като в Латвия, Литва и Унгария кредитът се свива с 8.3%, 5.4% и 6.0% средногодишно, а БВП се понижава съответно с 2.5%, 1.3% и 1.4% годишно. Във втората група е и Дания, макар че темповете на изменение при нея са по-малки. Вярна е и обратната интерпретация, че с намаляването на кредитите за фирмите и домакинствата намаляват личното потребление и фирмените инвестиции. Само с помощта на иконометрично изследване може да се определи доколко икономическото развитие влияе върху кредитирането, както и до каква степен кредитите са фактор за общоикономическата динамика, т.е. каква е посоката на връзките, като изследването на Статев (2009) показва, че след 1997 г. в България е налице двустранна каузалност между кредита и икономиката.

За по-пълно анализиране на динамиката на факторите на търсене на кредити е разгледан периодът 2004–2012 г., така че да се представи състоянието на икономиката преди началото на кризата и последващото ѝ развитие. В периода преди структурното прекъсване, предизвикано от кризата, икономиките на изследваните страни генерират висок растеж в унисон с глобалната възходяща тенденция. През периода 2004–2008 г. икономиките на България, Литва, Полша, Румъния и Чехия нарастват с между 5% и 7% средногодишно[23], докато темпът на растеж на БВП в Унгария е по-нисък (2.2%) заради нереформирания публичен сектор.[24] Кризата настъпва по-рано във Великобритания,

[23] Годишният темп на изменение на БВП за всички страни е изчислен като геометрична средна.

[24] В периода 2004–2008 г. бюджетният дефицит в Унгария съответства средно на 6.5% от БВП, а публичният дълг нараства до 73% от БВП в края на 2008 г. Унгарската икономика губи конкурентоспособност. За това свидетелства динамиката на индикаторите на външния сектор. Дефицитът по текущата сметка възлиза средно на 9.3% от БВП в предкризисния период, а брутният външен дълг нараства до 123% от БВП.

Дания, Латвия и Швеция. В периода 2004–2007 г. икономиките им нарастват съответно с 3%, 1.8%, 10.3% и 3.7%. Латвийската икономика навлиза в рецесия още през 2008 г. поради натрупаните големи икономически дисбаланси и поемането на прекомерни рискове от страна на стопанските единици, както и заради липсата на по-ефективна антициклична политика. Развитите финансови системи на Великобритания, Дания и Швеция бързо пренасят колебанията на международните капиталови пазари върху икономиките им. Поради високия икономически растеж преди кризата и натрупаната положителна инерция България, Литва, Полша, Румъния, Унгария и Чехия отчитат първи годишен икономически спад през 2009 г. През пиковата за кризата 2009 г. икономическата активност в изследваните страни значително намалява. Годишният им БВП се понижава с между 4% и 17%, като единствено полската икономика успява да нарасне (с 1.6%). Най-голям е годишният спад на съвкупното производство в Латвия и Литва, съответно със 17.7% и 14.8%. Сривът във вътрешното и външното търсене, изтеглянето на капитали от икономиките, спадът в цените на финансовите и реалните активи имат основна вина за силно влошената стопанска активност през 2009 г.[25] През тази година физическият обем на износа на десетте страни се понижава средно с 12%, докато износът на Швеция намалява с 25%. Аналогична е динамиката и при фирмените инвестиции (бруто капиталообразуване), които като съотношение към БВП се понижават средно с 25% за десетте страни при 58% годишен спад в Литва и 34% спад в Латвия. Още от втората половина на 2009 г. са налице признаци за плахо икономическо възстановяване, но те не успяват да компенсират срива в икономическите показатели от първото тримесечие. През следващите три години преобладава възходяща тенденция в икономиката, въпреки че темповете

[25] Фактор за силното понижение на БВП през 2009 г. е и фискалната консолидация, провеждана от латвийското правителство. Разбира се, тя е в отговор и на изискванията на международните кредитори. В номинално изражение публичните разходи през 2009 г. се понижават със 17%. В някои от изследваните страни от ЦИЕ също е налице номинално понижение на публичните разходи. В Литва протича аналогичен процес на фискална консолидация, макар и в значително по-малък мащаб, като през 2009 г. публичните разходи се понижават с 3.3% в номинално изражение. През 2010 г. процесът на фискална консолидация в двете страни продължава да оказва влияние. В Чехия публичните разходи се понижават с 1.1% и 0.5% през 2010 и 2011 г. Освен чрез намаляване на разходи страните от ЦИЕ провеждат и фискална консолидация, базирана на повишение на данъците (косвените данъци се увеличават в Литва, Латвия, Полша, Румъния и Унгария).

на растеж са значително по-ниски от тези преди кризата. Инвестициите остават слабото звено в икономическото възстановяване, докато външното търсене може да бъде изведено на преден план като фактор, движещ растежа в периода след 2009 г., въпреки че през 2012 г. е налице слабо понижение в темпа на изменение на износа. Силното поевтиняване на британския паунд, румънската лея, шведската крона, полската злота, унгарския форинт и чешката крона през 2009 г. е фактор за нарастване на износа. По-ниският разменен курс на националните валути на Великобритания, Унгария, Румъния, Полша и Чехия продължава да има стимулиращ износа ефект. В края на 2012 г. само Полша (благодарение на по-затворената икономика и девалвацията на националната валута, стимулираща износа) и Швеция отчитат нарастване на реалния БВП в сравнение с периода преди кризата, като полската икономика не регистрира нито едно годишно понижение на БВП.

От началото на кризата безработицата нараства, публичните финанси са неустойчиви и се нуждаят от фискална консолидация, а инфлацията надвишава целевото равнище на ЦБ. За сериозността на икономическата ситуация говори и фактът, че в края на 2008 г. МВФ отпусна многомилиардно спасително финансиране на Латвия и Унгария[26], а през първото полугодие на 2009 г. – на Румъния[27], докато през същия период Полша[28] договори гъвкава кредитна линия с МВФ.

Динамиката при индекса на потребителските цени е силно възходяща в периода преди кризата, като в резултат от повишаващата се икономическа активност инфлацията в десетте страни е средно 4.6% за периода, а в Латвия, Литва и България са налице дори сигнали за прегряване на икономиката. Цените в трите държави нарастват средно с 9.9% през 2007 и 2008 г., докато в Латвия темповете на нарастване на цените превишават 10%. В резултат на кризата и по-слабото търсене инфлацията се понижава във всички страни, като през 2009 г. Латвия отчита дефлация (спад на ИПЦ от 1.4%). През 2009 г. и през следващите три години инфлацията е висока в Полша, Румъния и Унгария заради повишаване на данъчните ставки (ДДС

[26] Вж. Andersen, 2009.
[27] Вж. Romania IMF transactions report.
[28] Вж. IMF, 2009.

и акцизи най-вече). През 2009 г. е налице натиск за повишаване на цените в Полша, Румъния, Унгария, Великобритания и Швеция заради обезценката на националните валути и следващото от това поскъпване на вноса. Освен инфлацията, продиктувана от мерките на фискална консолидация, за повишението на общото ценово равнище в повечето страни допринасят цените на храните и административно регулираните цени.

В резултат от кризата рязко се увеличава диспропорцията между бюджетните приходи и разходи. Ако през 2008 г. дефицитът е 2.2% от БВП, през 2009 г. той нараства до 5.8% за десетте изследвани държави. След 2009 г. отрицателните бюджетни салда постепенно намаляват, като най-ниска е стойността през 2011 г., когато десетте държави регистрират отрицателно бюджетно салдо в размер средно на 2.9% от годишния БВП. През периода 2008–2012 г. средният годишен дефицит в Обединеното кралство е в размер на 9.4%, като това е и най-високата стойност за изследваните страни. Единствено Швеция и Унгария през 2011 г. и Латвия през 2012 г. реализират положително бюджетно салдо, съответно в размер на 0.1% от БВП, 4.3% от БВП и 0.1% от БВП. Еднократният ефект от национализацията на частни пенсионни фондове води до впечатляващия бюджетен излишък в Унгария през 2011 г. В края на 2010 г. Съветът на ЕС е започнал процедура при прекомерен дефицит за всички изследвани държави с изключение на Швеция.

Годишните бюджетни дефицити традиционно се покриват с емитирането на публичен дълг. Брутната публична задлъжнялост за десетте страни нараства от 33.5% от БВП през 2008 г. до 48.7% от БВП през 2012 г. По този показател най-добре се представя българската икономика със средна годишна задлъжнялост от 16% през периода 2008–2012 г., докато Унгария и Великобритания са с най-влошени показатели. През същия период техният брутен публичен дълг възлиза средно на 81% от БВП.

За овладяването на фискалните рискове латвийското правителство намалява бюджетните си разходи в номинално изражение през 2009 г., 2010 г. и 2011 г., съответно със 17.8%, 3.8% и 0.1%. Литва също предприема фискална консолидация чрез понижение на публичните разходи, като през 2009 г. и 2010 г. публичните разходи се редуцират съответно с 3.3% и 1%. През 2010 г. и 2011 г. чешкото правителство намалява публичните разходи съответно с 1.1% и 0.1% в номинално изражение, а британското правителство намалява публичните си разходи през 2012 г. с 2.5%.

Преобладаващо за изследваните страни в периода до края на 2008 г. е наличието на голям входящ поток на капитали и значителен изходящ поток на средства под формата на внос на стоки и услуги. Разбираемо търговските банки имат основна роля за опосредстването на тези процеси. Вследствие на кризата тази тенденция се обръща на 180 градуса, като се наблюдава процес на изтегляне на капитали и на рязко свиване на вноса, което заедно със стагнирането на БВП води и до излишъци по текущата сметка при повечето от изследваните страни. За периода 2004–2008 г. излишъкът по капиталовата и финансовата сметка е средно 21% от БВП за България, 17.5% за Латвия, 10.6% за Литва, 10.4% за Румъния и 9.4% за Унгария. Входящите капитали от такъв порядък стимулират индивидуалното частно потребление и фирмените инвестиции в основен капитал, което води до рекордни дефицити по текущите сметки, като за съответния период дефицитът по текущата сметка е средно 16.8% за България, 16.7% за Латвия, 10.5% за Литва и Румъния и 7.6% за Унгария. През периода от началото на 2009 г. до края на 2012 г. салдото по капиталовата и финансовата сметка е положително в размер средно на 1.7% от БВП на България, 4.4% на Румъния, 0.2% на Литва, почти нулево – на Унгария, и отрицателно от -2.4% на Латвия. За същия период отрицателно е салдото по текущата сметка в България средно 2.9% от БВП, в Румъния 4.3%, в Литва 0.1%, докато в Латвия и Унгария то е положително, съответно от 1.9% и 0.9%.

В някои страни, като Чехия и Полша, търговските и капиталовите потоци са с по-умерени тенденции. Икономиките на Дания и Швеция функционират при излишък по текущата сметка преди и след кризата, което е атестат за висока степен на конкурентоспособност. Същевременно и през двата периода в тези държави е налице изтичане на капитал. Великобритания се развива при умерени дефицити по текущата сметка в двата периода в рамките на 2.3% и 2.5% от годишния БВП. Преди и след кризата тя привлича капитали в същия порядък, отговарящи на размера на дефицита по текущата сметка. Икономиката ѝ е по-слабо конкурентоспособна, но заради развития финансов сектор и други дялове от сектора на услугите, а и заради „модната“ тенденция да се инвестира/живее във Великобритания страната е нетен получател на капитали.

### *Фактори на предлагането на кредити*

През периода преди кризата банковите системи в ЦИЕ претърпяват сериозни трансформации. Навлизането на чуждестранните банкови групи и банковата приватизация имат водещо значение за бързите темпове преди кризата, с които се увеличават кредитите, външните банкови пасиви, рентабилността, желанието за поемане на рискове. Банките увеличават дела на кредитите в активите си, съотношението кредити към депозити на нефинансовия сектор също нараства, докато съотношението между собствения капитал и активите, както и съотношението между ликвидните активи и активите се понижава, лихвените проценти по кредитите и депозитите също се понижават, което е показателно, че банките са уверени в микро- и макроикономическата среда.

След структурното прекъсване, причинено от кризата, се понижават темповете на прираст на кредитните агрегати (кредитите на нефинансовия частен сектор в частност). В Дания, Латвия, Литва и Унгария дори е отчетено средногодишно понижение в номиналните стойности на агрегатите. Налице е нежелание за поемане на рискове след 2008 г., когато домакинства и фирми увеличават спестяванията си под формата на банкови депозити, но кредитите за фирмите и домакинствата, респ. потреблението и инвестициите, не следват тази динамика, а в отделни случаи дори е налице растеж на депозитите и спад на кредитите. Такова развитие се наблюдава в Латвия, Литва и в по-малка степен в Дания. Желанието за увеличаване на спестяванията на частния сектор и неосъщественото от това повишение на кредитите и инвестициите е практическо проявление на ефекта на спестовността, дефиниран от Кейнс. В нормална икономическа обстановка наред с депозитите нарастват и кредитите заради мултиплициращия ефект на кредитно-депозитната дейност на банките, като това води и до нарастване на съвкупното търсене. Търговските банки в изследваните страни увеличават капитала и резервите си, като увеличават и другите си активи, различни от кредитите за частния сектор. В някои банкови системи се повишават паричните средства, в други се наблюдава увеличаване на инвестициите в дългови книжа, а в трети са налице и двете характеристики, т.е. банките се ориентират към увеличаване на буферите за посрещане на ново влошаване в икономическата конюнктура (вж. таблици 1 и 10).

Лихвената динамика при кредитите и депозитите е показателна за наличието на структурно прекъсване във финансовата система на всяка от разгледаните 10 страни. Разбира се, степента на реакция във всяка от тях е различна, различно във времето са разположени минимумът на лихвените проценти преди прекъсването, както и максимумът и последвалият минимум, характеризиращ нормализирането на конюнктурата (вж. таблица 11 в приложението).

Лихвите по кредитите и депозитите са фактор за търсенето и предлагането на кредити. Търсенето на кредити се влияе негативно от лихвите по тях, както и от лихвите по депозитите, които са своеобразен изразител на алтернативната цена на капитала. Валидна е обаче и хипотезата, че по-високите лихви по депозитите мотивират депозантите и превръщат някои от тях в заемополучатели, т.е. може да имат и положително влияние върху търсенето на кредити. Както става ясно и от прегледа на научната литература по темата, икономическата активност обективно е по-силен фактор за търсенето на кредити, но между лихвите и реалната икономика съществува взаимна обвързаност. В резултат от кризата лихвените проценти по кредитите рязко се повишават. Това повишаване в случая е изразител на нарасналите рискове за финансовата система и икономиката, а не е предизвикано от нарастване на съвкупното търсене. Изтеглянето на ликвидност от страна на чуждестранните банкови кредитори мотивира банките да се насочат към местните физически и юридически лица за попълване на необходимия привлечен ресурс. Лихвените проценти по депозитите на фирмите и домакинствата се повишават в периода след структурното прекъсване (СП), съответно с над 200% в Латвия, Литва, Швеция и Дания и с над 100% в Чехия, Унгария, Румъния и Полша (вж. таблица 11 в приложението). Освен на нарасналите разходи за финансиране, по-високите лихви по кредитите се дължат на увеличението на необслужваните кредити, на влошаването на показателите за реалната икономическа активност, както и на редица други лихвени детерминанти.

Ако бъдат отделени два периода с три екстремума – минимум в периода до структурното прекъсване, максимум за СП на кризата и минимум в последващия СП период, лихвите по кредитите за бизнеса и домакинствата (ипотечни и потребителски) в Латвия, Литва, Румъния, Дания, Швеция, Чехия и Унгария се повишават най-

силно по време на кризата.[29] В този период 5-годишните лихви по дългосрочните кредити за фирмите в Латвия се увеличават със 114%, а ипотечните и потребителските кредити със срочност над 5 години поскъпват съответно с 241% и 186%. В последващия СП период е налице силно поевтиняване на кредитите, като именно тази промяна е по-отчетлива за страните с по-силно повишение на лихвите по фирмените кредити по време на СП. В България, Великобритания и Полша динамиката при поскъпването на кредитите в резултат от кризата е относително по-плавна.

Потребителските кредити, особено тези с краткосрочен профил, поскъпват най-много, като годишни лихвени проценти в диапазона 15–30% се наблюдават в България, Румъния, Чехия, Латвия, Литва и Унгария. Липсата на обезпечения при потребителските кредити (в масовия случай) и по-високият процент необслужвани потребителски кредити мотивират банките да отчитат по-високите рискове чрез увеличаване на лихвените проценти. За разлика от фирмените и от ипотечните кредити за домакинствата лихвите по потребителските кредити не достигат нива, по-ниски от периода преди кризата.

Таблица 2

**РЕАЛНИ ЛИХВЕНИ ПРОЦЕНТИ***

(%)

| Държава | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|
| България | 4.46 | 1.23 | 1.86 | 0.70 | 2.26 | 6.71 | 8.12 | 5.45 | 7.35 |
| Чехия | 1.92 | 6.15 | 5.03 | 2.39 | 4.25 | 3.62 | 7.61 | 6.80 | 3.82 |
| Унгария | 7.21 | 5.91 | 4.43 | 3.46 | 4.66 | 7.21 | 4.36 | 5.56 | 5.77 |
| Латвия | 0.41 | -3.69 | -2.35 | -7.80 | -2.21 | 18.00 | 12.16 | 0.14 | 2.49 |
| Литва | 3.13 | -1.26 | -1.34 | -1.51 | -1.24 | 12.56 | 3.88 | n.a. | n.a. |
| Румъния | 9.19 | 6.51 | 2.89 | 0.28 | -0.48 | 12.53 | 7.59 | 3.76 | 13.69 |
| Великобритания | 1.77 | 2.20 | 1.69 | 3.24 | 1.54 | -0.68 | -2.21 | -1.80 | -0.90 |

* В данните на СБ не е наличен времеви ред за реалните лихвени проценти в Дания, Полша и Швеция.

Източник: Световна банка.

[29] Периодите не съвпадат за различните страни поради техните индивидуални особености. За целите на дескриптивния анализ максималната дължина на първия период е пет години, т.е. не повече от 5 години от минимума, предхождащ СП във финансовата система и икономиката на всяка страна.

В повечето страни лихвените проценти във втория период се понижават до по-ниски нива в номинално изражение от периода преди кризата. Това изменение следва глобалната тенденция на понижаване на лихвените равнища, подпомогната от паричната политика на ЦБ, а в някои случаи и от политиката на правителствата (например мерки по капитализирането на ТБ). Въпреки поевтиняването на кредитите в периода, последващ СП, по-ниската инфлация в повечето страни в следкризисния период не позволява реалните лихвени проценти по кредитите и депозитите да спаднат до предкризисните си нива.

Предлагането на кредити е в положителна зависимост от лихвите по кредитите, но ТБ в по-голяма степен отчитат нетния лихвен доход, в който са включени и разходите за привлечения банков ресурс (депозитите на фирмите и домакинствата). Очевидно е, че по-ниските лихви през втория период не стимулират търсенето на кредити. Изравняването на темповете на кредитен растеж преди СП е трудно осъществимо. В някои от разглежданите държави дори е налице номинален спад на кредитните салда. Възможно е и ТБ да не желаят да кредитират при лихвени равнища по-високи от техния оптимум, след който по-вероятните заемополучатели са клиенти, които са с високи шансове да изпаднат в състояние на неплатежоспособност, което в крайна сметка ще доведе до нарастване на необслужваните кредити.[30] В допълнение броят на клиентите, които ще изпаднат в неплатежоспособност, се увеличава и от негативната икономическа конюнктура.

Търговските банки в изследваните десет държави притежават различен бизнес модел – докато банките в ЦИЕ се придържат в по-голяма степен към традиционна депозитно-кредитна дейност, банките във Великобритания, Швеция и Дания са с по-голяма експозиция към финансовите инструменти, в частност дълговите пазари. Именно във Великобритания, Дания и Швеция под 50% от банковите активи са разпределени под формата на кредити за частния нефинансов сектор в Дания, като това е видно за всяка една от годините в периода 2008–2012 г. Тази особеност се наблюдава и при банковите системи на Чехия и Унгария. Банковите системи на тези страни обаче са изложени на по-голям риск от промяната в цените на дълговите инструменти. Нарастващата публична задлъжнялост и недотам ефективните методи за

[30] Вж. Stiglitz and Weiss, 1988.

справяне с дълговите кризи в отделни страни в ЕС могат да изложат банковите им системи на допълнително изпитание.

В периода 2008–2012 г. ТБ се стремят да изравнят не само матуритетната, но и валутната структура на своите пасиви и активи, което се дължи на валутната композиция на пасивите. Кредитирането в чуждестранна валута е силно застъпено в България, Латвия, Литва, Румъния и Унгария. Във Великобритания, Дания и Швеция банките кредитират основно в национална валута. Към третото тримесечие на 2011 г. делът на кредитите в швейцарски франкове от общите банкови кредити е около 35% в Унгария, 20% в Полша и 7% в Румъния.[31] От кредити във франкове най-вече са се възползвали домакинствата, като рязкото поскъпване на франка спрямо еврото и останалите валути прави редица кредити, деноминирани в швейцарски франкове и платими в местни валути (форинти, злоти, леи), трудни за обслужване. В резултат от девалвацията на националните им валути кредитите във валута в Унгария и Румъния предизвикват допълнително влошаване на банковите баланси. Паричните съвети в България и Литва и фиксираният валутен курс в Латвия обаче се оказват устойчиви на финансовите и икономическите шокове. В трите страни кредитирането във валута, различна от националната и резервната валута е слабо застъпено и не представлява системен риск, доколкото доброто функциониране на паричния съвет, зависещо от балансираната фискална политика, антицикличната парична политика и консервативния банков надзор, гарантира разменния курс между националната и резервната валута. Разбира се, в Латвия са предприети сериозни мерки за фискална консолидация, така че да се отговори на изискванията на правителствените кредитори за получаване на валутни заеми, както и да се гарантира курсът на лата чрез намаляване на фискалните дисбаланси.

През периода преди кризата външните банкови пасиви увеличават значението си като източник на финансиране за ТБ в повечето от изследваните страни. След нейното начало възходящата тенденция се пречупва и започва процес на намаляване на задлъжнялостта на банките към външния сектор. Може да се допусне, че външните пасиви имат силно и правопропорционално влияние върху предлагането на кредити в изследваните икономики.

[31] Вж. Yeşin, 2013.

В страните от ЦИЕ външните пасиви до голяма степен представляват финансиране, осигурено от чуждестранните банкови централи. Преди началото на кризата външните пасиви финансират 17% от банковите активи в Полша, 22% в Дания, 27% в България, 29% в Швеция и Унгария, 31% в Румъния, 45% в Литва и 59% в Латвия. Към края на 2012 г. външните пасиви финансират 13% от активите в Полша, 15% в Дания, 14% в България, 18% в Унгария, 19% в Швеция, 23% в Румъния, 28% в Литва и 49% в Латвия.

Изтеглянето на ликвидност от чуждестранните кредитори изправя търговските банки, централните банки и правителствата пред сериозни предизвикателства. В тази посока действа и Виенската инициатива, която има за цел да предотврати застрашаващо системата изтегляне на капитали от поделенията на международните банкови групи в ЦИЕ.[32] Чрез редица договорености между отделните ЦБ и правителствата, както и между банковите централи и международните финансови институции се цели предотвратяването на шоково изтегляне на капитали от банковите системи на Латвия, Румъния и Унгария.[33] България не е част от тази инициатива, като изтеглянето на ликвидност от банковите централи в страната напълно се компенсира от ръста в депозитите на нефинансовия сектор в страната.

Намаляването на външните пасиви (номинално и като съотношение спрямо активите) е обща тенденция за изследваните държави с изключение на Полша. Изтичането на ликвидност към външни кредитори е процес, който принуждава банките да търсят алтернативни източници на финансиране, и възпиращ фактор за кредитното предлагане. Растежът на депозитите на частния нефинансов сектор обаче компенсира и позволява изтичането на ликвидност. Банковите депозити нарастват във всички изследвани страни с изключение на Унгария. Средногеометричният темп на растеж (2008–2012 г.) на депозитите на фирмите и домакинствата в България, Чехия, Великобритания, Латвия, Полша и Швеция е в диапазона 5.7–13%, който освен за нарастващо доверие в банковата система е сигнал и за нежеланието за поемане на рискове, особено когато кредитите не отбелязват същата динамика.

[32] От таблици 1 и 10 се вижда, че през разглеждания период външните пасиви (дължими към нерезиденти) не намаляват само в Полша, т.е. постфактум Виенската инициатива не успява да предотврати изтичането на чуждестранни пасиви на ТБ.

[33] Вж. Kolev and Zwart, 2013.

Повишението на коефициентите за ливъридж и ликвидност и понижението на съотношението „кредити/депозити" сигнализират, че е налице промяна в усещането за риск на ТБ. Увеличаването на необслужваните кредити и изтичането на външни пасиви от банките води до по-предпазливо поведение на банките.

Таблица 3

**КОЕФИЦИЕНТ НА ЛИВЪРИДЖ**

(%)

| Държава | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| България | 11.1 | 12.7 | 12.8 | 12.6 | 12.1 |
| Великобритания | 6.1 | 7.3 | 7.7 | 8.5 | 9.3 |
| Дания | 5.5 | 5.5 | 5.5 | 5.1 | 5.3 |
| Латвия | 7.5 | 7.6 | 7.6 | 7.9 | 9.6 |
| Литва | 8.5 | 11.4 | 13.1 | 13.5 | 13.6 |
| Полша | 10.7 | 13.3 | 13.5 | 13.1 | 14.1 |
| Румъния | 10.6 | 12.0 | 14.1 | 16.0 | 18.0 |
| Унгария | 7.4 | 8.0 | 7.9 | 7.7 | 9.0 |
| Чехия | 9.3 | 10.5 | 11.0 | 10.9 | 11.6 |
| Швеция | 4.6 | 5.7 | 5.8 | 5.7 | 5.9 |

Източници: ЕЦБ, собствени изчисления.

През 2012 г. банковите системи в десетте страни имат поголям капацитет както за поемане на нови загуби, така и за бъдещо увеличаване на кредитирането. Банковата система в Дания е изключение от общата динамика, а коефициентът на ливъридж в Чехия нараства по-бавно. Най-консервативни и най-добре капиталово обезпечени според този индикатор са банковите системи в България, Литва, Полша, Румъния и Швеция, което позволява да се абсорбират бъдещи отрицателни шокове в икономическата среда.

Таблица 4

**КОЕФИЦИЕНТ НА ЛИКВИДНИ АКТИВИ КЪМ БРУТНИ АКТИВИ**

(%)

| Държава | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| България | 19.0 | 18.9 | 20.9 | 22.0 | 22.4 |
| Великобритания | 29.8 | 20.5 | 21.0 | 20.5 | 22.5 |
| Дания | 14.9 | 18.8 | 17.7 | 17.0 | 19.1 |
| Латвия | 7.1 | 22.6 | 22.3 | 30.9 | 34.7 |
| Литва | 21.1 | 23.4 | 23.1 | 25.5 | 23.9 |
| Полша | 17.0 | 20.3 | 20.8 | 19.5 | 20.9 |
| Румъния | 47.1 | 57.5 | 60.0 | 58.7 | 57.6 |
| Унгария | 18.1 | 23.5 | 22.3 | 24.7 | 30.8 |
| Чехия | 25.8 | 27.1 | 29.4 | 29.9 | 32.6 |
| Швеция | 19.0 | 21.6 | 20.9 | 22.5 | 21.4 |

*Източник:* МВФ – *Financial Soundness Indicators (FSIs).*

Банките подобряват значително ликвидната си позиция. Ако към края на изследвания период този процес се разглежда като натрупване на буфер за бъдещо влошаване на качеството на активите, то при по-ясни положителни сигнали за икономиката част от тази ликвидност ще се трансформира в кредити. През периода 2008–2012 г. делът на ликвидните активи в общите активи се повишава във всички разглеждани страни с изключение на Великобритания, докато в Латвия дори е налице четирикратно повишение заради ниската база, от която тръгва латвийската банкова система през 2008 г.

Повишението на капиталовата адекватност, коефициентите на ливъридж и коефициентите на ликвидност се дължи в определена степен на синхронизираните мерки за постепенно въвеждане на регулаторната рамка, договорена на срещата на страните от Г-20 през 2008 г., която се включва в стандартите на Базелския комитет за капиталова адекватност и ликвидност от декември 2010 г., познати още като Базел III, и които са залегнали в Директивата за капиталовите изисквания и в Регламент (ЕС) 575/2013 на Европейския парламент и на Съвета от 26 юни 2013 г. относно пруденциалните изисквания за кредитните институции и инвестиционните посредници и за изменение на Регламент (ЕС) № 648/2012.

Необслужваните кредити нарастват неколкократно след началото на кризата. Ако в периода 2004–2008 г. средното

съотношение между стойността на необслужваните кредити и брутния размер на кредитите за представените в таблицата страни е малко над 2.5%, в последващия период то е 9.2%.

Таблица 5

**НЕОБСЛУЖВАНИ БАНКОВИ КРЕДИТИ* ОТ БРУТНИЯ РАЗМЕР НА БАНКОВИТЕ КРЕДИТИ**

(%)

| Държава | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|
| България | 2.0 | 2.2 | 2.2 | 2.1 | 2.5 | 6.4 | 11.9 | 14.9 | 16.9 |
| Великобритания | 1.9 | 1.0 | 0.9 | 0.9 | 1.6 | 3.5 | 4.0 | 4.0 | 3.7 |
| Дания | 0.7 | 0.4 | | 0.6 | 1.2 | 3.3 | 4.1 | 3.7 | 4.0 |
| Латвия | 1.1 | 0.7 | 0.5 | 0.8 | 2.1 | 14.3 | 15.9 | 13.9 | 11.0 |
| Литва | 2.2 | 0.6 | 1.0 | 1.0 | 4.6 | 19.3 | 19.7 | 16.3 | 18.0 |
| Полша | 14.9 | 11.0 | 7.4 | 5.2 | 4.4 | 7.9 | 8.8 | 8.2 | 8.4 |
| Румъния | 8.1 | 2.6 | 1.8 | 2.6 | 2.8 | 7.9 | 11.9 | 14.3 | 16.8 |
| Унгария | 2.7 | 2.3 | 2.6 | 2.3 | 3.0 | 6.7 | 9.8 | 13.4 | 15.8 |
| Чехия | 4.0 | 3.9 | 3.6 | 2.4 | 2.8 | 4.6 | 5.4 | 5.2 | 5.1 |
| Швеция | 1.1 | 0.8 | 0.8 | 0.1 | 0.5 | 0.8 | 0.8 | 0.7 | 0.7 |

* В страните се използва различна методология за определяне на отделния кредит като необслужван, като най-често това са периодът на просрочие и качествени характеристики на платежоспособността на кредитополучателя (вж. бележките към таблица 6).

Източник: СБ.

Растежът на необслужваните кредити е в голяма степен функция от общоикономическата среда и в по-малка степен от кредитната политика и системите за управление на риска в отделната банка. Само по себе си нарастването на необслужваните кредити е притеснително, но е важно да се следи доколко показателят е обезпечен с провизии и собствен капитал. Необслужваните кредити са функция най-вече на икономическата активност (реалния БВП например) и отчасти на лихвените проценти, като спрямо първата променлива е налице обратнопропорционална зависимост, докато спрямо лихвените равнища зависимостта е положителна.[34] През 2012 г. непровизираната част от лошите кредити съответства на 63% от СК в Литва и на 53% в Унгария. Съотношението намалява при продажбата на лоши кредити, при превръщането на кредитите

[34] Вж. Beck et al., 2013.

в такива с по-нисък риск, при увеличение на собствения капитал чрез капитализиране на печалби или чрез емисия на капиталови инструменти (вж. таблица 6). Налице са редица методологически особености при отчитането на необслужваните кредити в отделните страни (вж. забележката под таблица 6). Въпреки тези различия по-важна е тенденцията за отделната страна, отколкото сравнимостта. Според изследването на Pastory and Mutaju (2013) нарастването на непровизираната част на лошите кредити към собствения капитал стимулира повишаването на капиталовата адекватност на банковата система.

Таблица 6

**НЕПРОВИЗИРАНА ЧАСТ НА ЛОШИТЕ КРЕДИТИ КЪМ СОБСТВЕНИЯ КАПИТАЛ**

(%)

| Държава | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| България | 3.5 | 15.1 | 28.0 | 36.9 | 38.9 |
| Великобритания | 8.6 | 14.8 | 16.9 | 16.1 | 14.5 |
| Дания | | | 23.7 | 24.8 | 32.1 |
| Латвия | 12.3 | 104.6 | 98.8 | 75.6 | 19.4 |
| Литва | 44.0 | 128.7 | 99.4 | 80.9 | 62.5 |
| Полша | 8.3 | 13.8 | 11.5 | 11.6 | 12.9 |
| Румъния | 10.7 | 11.3 | 15.7 | 16.5 | 14.4 |
| Унгария | 15.6 | 33.0 | 49.3 | 59.0 | 52.9 |
| Чехия | 12.9 | 21.9 | 25.6 | 24.5 | 23.6 |
| Швеция | 8.1 | 12.5 | 11.2 | 9.7 | 9.4 |

Забележка: *Необслужваните кредити притежават различни методологически особености по отделните страни. Според поясненията на интернет сайта на МВФ за индикаторите за финансова стабилност (Financial soundness indicators) – http://fsi.imf.org, необслужвани кредити в България са тези с просрочие над 90 дни, като винаги трябва да се съблюдават изискванията за платежоспособността на кредитополучателя или групата кредитополучатели. Подобни са времевият срок и условията за определяне на кредитите като необслужвани и във Великобритания, Латвия, Румъния, Чехия, Унгария. За класифицирането на кредитите като необслужвани в Литва и Швеция се използва 60-дневно просрочие. В Дания условията за класифицирането на кредитите са по-малко консервативни и е разрешена по-голяма свобода за определянето им като необслужвани. В Полша правилата за класифициране на кредитите са по-малко консервативни, дори нормативната уредба насърчава ТБ да не бързат с класифицирането на кредитите като необслужвани и с евентуалното им отписване от банковите баланси, и им предоставя право да си начисляват приходи от лихви до три години (вж. IMF, 2013). Различия в сравнимостта може да се появят и заради факта, че някои от разглежданите страни не са въвели напълно регулативната рамка Базел II, докато други вместо международни счетоводни стандарти за разпознаване и оценка на необслужваните кредити използват местни счетоводни стандарти. Степента на обезпеченост и кръгът от приеманите обезпечения са друг източник на различия сред изследваните страни.*

Източник: МВФ (Financial Soundness Indicators (FSIs).

Може обаче да се обобщи, че ЦБ в някои държави подценяват рисковете преди кризата и не успяват да се справят с бързия кредитен растеж и прегряването на икономиката (проблемът с прегряващата икономика е обект и на общата икономическа политика на отделната страна), стимулирайки ТБ да генерират буфери. В резултат от кризата рисковете се материализират, като банковите системи в Латвия, Литва и Унгария се оказват в по-лоша позиция за акумулирането на загуби (коефициентът за ливъридж в тези три държави е с по-ниска стойност спрямо останалите бързоразвиващи се икономики от региона на ЦИЕ). През 2008 г. коефициентите на ликвидност сигнализират за подценени рискове в някои от разгледаните страни (за Латвия показателят е 7.1% при стойности между 19% и 47% за България, Литва, Чехия и Румъния). До края на 2012 г. всички банкови системи постепенно подобряват ликвидната си позиция.

Рентабилността в банковите системи на изследваните страни се понижава заради влошеното качество на активите, предизвикано от негативната икономическа конюнктура. Банките в Литва и Латвия отчитат сериозни загуби през 2009 г. и 2010 г., но през 2012 г. се наблюдава сериозно подобрение в рентабилността. Румънската и унгарската банкова система влошават рентабилността си и през 2011 г., и 2012 г. За разлика от тях ТБ в Чехия и Полша се представят най-добре през разглеждания период, съдейки от стойностите и динамиката на коефициента на рентабилност на активите. Трябва да се отчете фактът, че редица банкови системи са обект на извънредни антициклични и спасителни мерки от страна на ЦБ и правителствата. За разлика от тях българската банкова система, благодарение на генерираните буфери и на надзорната дейност на БНБ, въпреки слабото икономическо възстановяване успява да реализира печалби, с които подобрява капиталовата си база и капацитета си за поемане на нови загуби, както и за увеличаване на кредитирането, когато условията станат благоприятни.

Таблица 7

**ВЪЗВРЪЩАЕМОСТ НА АКТИВИТЕ**

(%)

| Държава | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| България | 2.1 | 1.1 | 0.8 | 0.6 | 0.7 |
| Великобритания | -0.1 | 0.0 | 0.3 | 0.3 | 0.3 |
| Дания | | | 0.0 | 0.0 | 0.1 |
| Латвия | 0.2 | -3.9 | -1.8 | 0.5 | 2.0 |
| Литва | 1.1 | -4.5 | -0.4 | 1.7 | 1.1 |
| Полша | 1.5 | 0.8 | 1.0 | 1.3 | 1.2 |
| Румъния | 1.6 | 0.2 | -0.2 | -0.2 | -0.6 |
| Унгария | 1.1 | 0.6 | 0.0 | -0.7 | -0.1 |
| Чехия | 1.1 | 1.4 | 1.3 | 1.2 | 1.4 |
| Швеция | 0.6 | 0.4 | 0.6 | 0.6 | 0.7 |

Източник: МВФ – *Financial Soundness Indicators (FSIs).*

Централните банки в разглежданите страни са активна страна в процеса по поддържане стабилността и ликвидността на банковия пазар. Дезинфлацията и възможността за подкрепа на икономиката в рамките на мандата им позволява на ЦБ да провеждат стимулираща парична политика. Понижаващата се инфлация, очакванията за по-ниска инфлация в резултат от слабото икономическо търсене и нуждата ТБ да управляват по-добре ликвидността си мотивира ЦБ на Англия, Дания, Латвия, Полша, Румъния, Унгария, Чехия и Швеция да намаляват основните лихвени проценти[35].

[35] Английската централна банка намалява основния лихвен процент от 5.75% към 5 юли 2007 г. до 0.5% към 5 март 2009 г. От март 2009 г. Банката въвежда нулева лихва по депозитите на ТБ, съхранявани при нея, стимулирайки ТБ да кредитират, а не да увеличават вземанията си от ЦБ. Датската централна банка намалява дисконтната лихва по текущите депозитни сметки чрез серия от понижения, съответно от 4.5% към октомври 2008 г. до 0% през ноември 2012 г. Рефинансиращата лихва се понижава постепенно от 5.5% (към октомври 2008 г.) до 0% (през юни 2012 г.), а лихвеният процент по депозитните сертификати е понижен от 5.5% към октомври 2008 г. до отрицателна стойност от -0.2% с цел да се намалят вземанията на ТБ от ЦБ. Латвийската централна банка понижава на стъпки рефинансиращата лихва от 6% до 2.5% в периода 24.03.2009–24.09.2012 г. Аналогична е тенденцията при пределния лихвен процент по заемния механизъм на Банката. Овърнайт депозитната лихва и 7-дневната депозитна лихва също се понижават, като от 3% към 24 февруари 2008 г. ЦБ на Латвия ги намалява постепенно на 0.05% и 0.075% съответно.

Аналогично е поведението и на останалите ЦБ в периода след началото на кризата, които рязко намаляват контролираните от тях лихвени проценти, така че ТБ да управляват по-лесно и достъпно ликвидността си.

В началото на 2009 г. лихвите на междубанковия пазар рязко се повишават, а изтъргуваните обеми рязко се понижават, тъй като се увеличава недоверието между ТБ. Ситуацията през 2009 г. изисква и непопулярни мерки по запазване стабилността на финансовата система, увеличаване на ликвидността ѝ и успокояване на паричните, а оттам и на финансовите пазари като цяло. Освен традиционните мерки по понижаване на лихвените проценти, намаляване на ЗМР (изключение са страните, в които не са налични ЗМР, както и Чехия, в която нормата на ЗМР остава непроменена) се предоставя по-дългосрочна ликвидност на ТБ, като се разширява и кръгът на активите, които се приемат като обезпечения по репо финансирането от ЦБ, както и в синхрон с правителствени институции се реализира рекапитализиране и финансиране на банки с капиталови и ликвидни проблеми. От март 2009 г. английската централна банка стартира програма по изкупване на активи (главно ДЦК), с което се стреми да влее ликвидност в икономиката и финансовата система, като се целѝ продавачи на ДЦК да не са банки, а фирми и домакинства, т.е. прави се опит да се насърчи и съвкупното търсене. От 75 млрд. паунда тази програма се разраства до 375 млрд. паунда през юли 2012 г., като размерът ѝ остава непроменен до края на 2012 г.

През октомври 2008 г. централната банка на Полша въвежда допълнителни парични инструменти, с които да успокои паричния пазар и с които ТБ могат по-добре да управляват ликвидността си. Банката започва да предоставя по-дългосрочно финансиране на ТБ, като въвежда дори тримесечни репо заеми за сметка на 7-дневните преди кризата. Тя увеличава броя на инструментите, които приема като обезпечение, и осигурява финансиране в чуждестранна валута чрез суапови операции. В сила от 30 юни 2009 г. ЦБ на Полша намалява нормата за ЗМР с 0.5% до 3.0% от депозитите. На 30 октомври 2010 г. повишава резервната норма с 0.5% до 3.5%. ЦБ изплаща на ТБ лихва за размера на задължителните резерви, държани при нея, в размер на 90% от редисконтната лихва.

Румънската централна банка увеличава ликвидността в системата, когато това е най-необходимо, особено през 2009 г., посредством 30-дневни репо заеми в допълнение на традиционните 7-дневни заеми.

Унгарската централна банка представя два нови инструмента на паричната си политика, като от 21 октомври 2008 г. предоставя двуседмични и шестмесечни обезпечени заеми. За обезпечения се

приемат ипотечни и корпоративни облигации с рейтинг *BBB–* или по-висок, правителствени и корпоративни еврооблигации, общински облигации. От април 2012 г. ЦБ предоставя и 2-годишни обезпечени заеми, улеснявайки ТБ да управляват дългосрочната си ликвидност и диспропорцията в срочността на активите и пасивите. В края на 2008 г. и в началото на 2009 г. ЦБ на Унгария договаря суапово финансиране с ЕЦБ и ЦБ на Швейцария, като успява да увеличи ликвидността на валутния и паричния пазар и да задоволи търсенето на евро и франкове с предпазна и спекулативна цел.

Банковият сектор в редица държави се подпомага с публични ресурси, за да не се допусне системна банкова криза, която да засегне още по-сериозно и без това влошената икономическа активност. Британското правителство стартира няколко програми[36] след края на 2008 г. на обща стойност от около 690 млрд. евро (44% от БВП на Великобритания за 2008 г.).[37]

През 2008 г. заради ликвидни проблеми малката датска банка Трелеборг е продадена на Сидбанк под натиска на централната банка на Дания. Заради големите си обезценки по необслужвани кредити Роскилде Банк е капитализирана от ЦБ и Асоциацията на банките чрез повишаване на капиталовата ѝ база с около 4.5 млрд. крони. През август 2009 г. участието на ЦБ на Дания в капитала на Роскилде е прехвърлено на държавната Компания за финансова стабилност.

През ноември 2008 г. латвийското правителство придобива 51% от втората най-голяма ТБ в страната Парекс Банк, като заплаща по 2 лата за акция на изпадналата в ликвидна криза банкова институция. В допълнение 34% от акциите на Парекс Банк са прехвърлени на държавната Ипотечна и поземлена банка като допълнителна гаранция по сделката. В началото на април 2009 г. ЕБВР придобива 25% + 1 акция от Парекс Банк срещу инвестиция от 106 млн. евро в капитал и подчинен срочен дълг. Чрез действията си латвийското правителство и ЦБ предотвратяват още по-неблагоприятно развитие в банковия и финансовия сектор.

На 16 ноември 2011 г. литовското правителство национализира 100% от капитала на Снорас банк, като на 24 ноември банката

[36] Включват програма за гарантиране на активите, програма за гарантиране на задълженията и програма за рекапитализиране на ТБ.

[37] Вж. Panetta et al., 2009.

обявява банкрут, след като централната банка на Литва ѝ отнема лицензa за извършване на банкова дейност. Снорас банк е с пазарен дял от 6.2% при кредитите и 13% при депозитите, но въпреки преустановяването на дейността ѝ не последва материализирането на системен риск. Доверието в системата бързо се завръща, след като фондът за застраховане на депозитите започва да изплаща сумите по гарантираните със закон влогове.

В Швеция националната служба по обслужване на дълга (*National Debt Office*) гарантира новоемитирания дълг на ТБ за 325 млрд. шведски крони, или около 10% от БВП, като по този начин осигурява на ТБ финансиране с приемлива доходност, за да могат по-добре да управляват пасивите и активите си. Шведското правителство осигурява инструмент за рекапитализиране на ТБ в размер от 50 млрд. шведски крони.

Изреденото дотук не изчерпва всички антикризисни мерки на централните банки, но маркира някои от по-важните събития, при които за пореден път се разкриват предизвикателствата, които поставя кризата пред националните финансови системи и паричните власти.

## Фактори на търсенето и предлагането на кредити в България

### *Общоикономическа динамика*

*Националната икономика нараства с впечатляващи темпове след началото на новото хилядолетие до края на 2008 г., когато международната конюнктура рязко се влошава и поставя на изпитание малката и отворена българска икономика. За изпреварващия икономически растеж до началото на кризата (последното тримесечие на 2008 г.) принос има сложна симбиоза от фактори, които до голяма степен са свързани помежду си. По-важните от тях са стабилността на лева и финансовата система, подсигурена от паричния съвет и консервативната парична и надзорна политика на БНБ, банковата приватизация и съпътстващият трансфер на ноу-хау, депозитно-кредитната дейност на ТБ, приемствената фискална политика на бюджетни излишъци, чуждестранните инвестиции, вътрешното и външното търсене, членството в ЕС и свързаното с това синхронизиране на законодателството и институциите, благоприятната международна конюнктура и други фактори. Разбира се,*

*такова бързо развитие няма как да не доведе до формирането на икономически дисбаланси във вътрешноикономически и външноикономически план. Растежът е съпроводен от висока инфлация, нездраво големи дефицити по текущата сметка, както и от бързо увеличаваща се задлъжнялост към резиденти и нерезиденти. В резултат от кризата тези тенденции се обръщат на 180 градуса, като започва и постепенното разчистване на натрупаните вътрешно- и външноикономически дисбаланси.*

*В петгодишния период до края на 2008 г. растежът се интензифицира, като реалният БВП нараства средно с 6.4% годишно, или с неколкократно по-висок темп от наблюдавания във Великобритания, Дания и Швеция. В последващия период – от края на 2008 г. до края на 2012 г., БВП в постоянни цени се понижава средногодишно с 0.7%, като през кризисната за българската икономика 2009 г. реалното производство се свива с 5.5%. През 2009 г. се понижават всички компоненти на съвкупните разходи, но най-голям принос за икономическия спад имат пониженият износ (намалява с 11.2% на годишна база в реално изражение) и инвестициите в основен капитал (свиват се със 17.6%). През 2010 г. икономиката нараства с 0.2%, а през 2011 г. с 1.8%, като основен принос за растежа има външното търсене. През 2012 г. икономическият растеж намалява до 0.8%, но остава положителен благодарение на потреблението на домакинствата и изменението на запасите.*

*В периода 2004–2008 г. хармонизираният индекс на потребителските цени нараства с 8% средногодишно, а през 2008–2012 г. темпът на нарастване на цените се понижава до 2.8% годишно. Спадът във вътрешното търсене през периода 2008–2012 г. води и до по-ниска инфлация. През втория период основен принос за инфлацията имат стоките и услугите с административно определяни цени, храните и енергийните продукти, като ХИПЦ е близо до средните нива на показателя за ЕС.*

*Пазарът на труда следва икономическата динамика в периода на висок икономически растеж, като заетостта нараства, а безработицата се понижава. Коефициентът на безработица в края на 2008 г. е на най-ниското си равнище за целия период на преход – 5.7%. В резултат на кризата безработицата започва да нараства, като в края на 2012 г. броят на безработните възлиза на 12.4% от работната сила. В годините на растеж след началото на кризата (2010–2012 г.) производителността на труда се повишава, но за създаването на нови работни места е необходим по-висок растеж.*

*Високата норма на безработица разбираемо е ограничителен фактор за търсенето на кредити, но като фактор тя рядко се включва в променливите, обясняващи кредитите, поради лаговия ѝ характер.*

*Фискалната политика е фактор за икономическата активност, но предвидимата и балансирана фискална политика е единият от двата основни стълба, на които се крепи валутният борд, респ. финансовата система и икономиката като цяло. Вторият стълб, на който се крепи валутният борд, е стабилната банкова система, която се поддържа от антицикличната парична политика на БНБ и консервативния банков надзор.*

*Всички правителства след 1997 г. до началото на кризата се придържат към политика на балансиран бюджет, като в годините на висок икономически растеж приходите често превишават разходите, което позволява генерирането на фискални буфери. През периода 2004–2008 г. е налице бюджетен излишък със средна годишна стойност от 2.7% от БВП. Българските правителства намаляват задлъжнялостта си и генерират буфери, благодарение на които безпроблемно се емитира нов дълг и се използва фискалният резерв за финансиране на дефицитите в периода 2008–2012 г. със средна годишна стойност от 1.8% от БВП. Към края на 2008 г. публичният дълг се понижава до 15.5% от БВП и нараства до 18.5% от БВП към края на 2012 г. В периода след 2008 г. българските правителства осъществяват консервативна фискална политика, като страната е сред лидерите в ЕС по ниски нива на дефицита и публичния дълг.*

*През периода 2004–2008 г. българската икономика функционира при растяща външна задлъжнялост, големи дефицити по текущата сметка (средно 16.8% от БВП) и излишък по капиталовата и финансовата сметка (21% от БВП средногодишно). След 2008 г. започва процес на намаляване на външната задлъжнялост, период на умерени дефицити по текущата сметка (през 2011 г. е регистриран дори излишък) и излишъци по капиталовата сметка (през 2010 г. и 2011 г. салдото по финансовата и капиталовата сметка е отрицателно в размер на 1.1% и 1% от БВП).*

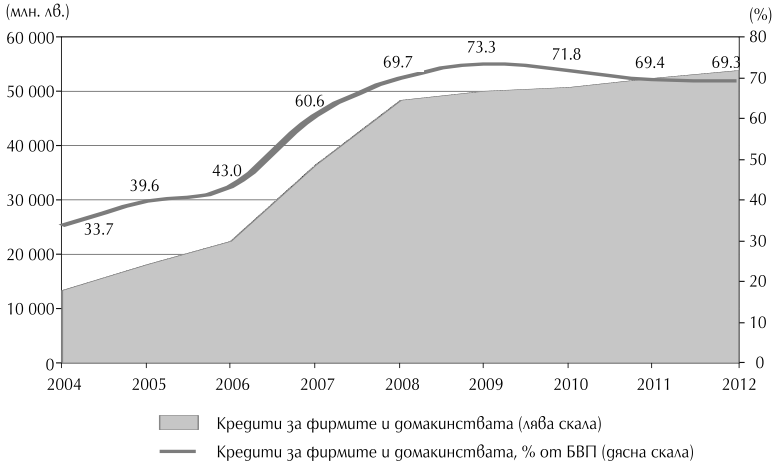
*В края на 2004 г. брутният външен дълг (БВД) възлиза на 61.7% от БВП, докато в края на 2008 г. съответства на 105% от БВП. В последващия период е налице процес на намаляване на външната задлъжнялост, като БВД се понижава до 94.8% от БВП. Тази динамика се дължи на изпреварващия номинален растеж на знаменателя. В периода 2008–2012 г. ТБ намаляват задълженията си към външния*

*сектор с 2.6 млрд. лева (с 29%), докато вътрешнофирмените заеми се увеличават с 2.1 млрд. лева (с 15.3%), а публичният външен дълг нараства с 850 млн. лева (с 9%). Ситуацията с брутната външна задлъжнялост не е притеснителна от гледна точка на факта, че 58% от БВД е между банките и банковите им централи, както и между местните компании и чуждестранните им компании майки, т.е. няма как да станем свидетели на изтегляне на спекулативен капитал, който да навреди на финансовата система и икономиката като цяло.*

*Слабото вътрешно търсене, изтичането на капитали от страната и недостатъчните чуждестранни инвестиции не са в състояние да бъдат компенсирани от растежа на износа. Заради комбинацията от тези фактори и поради икономическата неопределеност в ЕС домакинствата и фирмите остават предпазливи в очакванията си. Усещането им за риск е все още високо, което води до слаба предприемаческа активност и слабо търсене на кредити. Предпазливостта на стопанските единици е предопределена и от спада на цените на финансовите и реалните активи (търговски и жилищни имоти), които оказват влияние чрез ефекта на дохода и ефекта на баланса.*[38]

Графика 1

**ДИНАМИКА НА КРЕДИТА ЗА ЧАСТНИЯ НЕФИНАНСОВ СЕКТОР**




Източници: ЕЦБ, собствени изчисления.

[38] Подобна зависимост се разкрива в изследванията на Blundell-Wignall and Gizycki (1992), Pazarbasioglu (1996), Altunbas et al. (2009), Gambacorta and Marqués – Ibáñez (2011).

## *Кредити и фактори на предлагането на кредити (динамика)*

*Финансовият сектор, който е доминиран от банковия сектор в България, се развива в сложна взаимовръзка с реалната икономика. Не едно и две изследвания с голяма степен на вероятност доказват, че парите не са неутрални и че динамиката във финансовия сектор е следствие от икономическия растеж, но и фактор за него. Емпирично проверено е, че и в България е налице двустранна каузалност, особено през периода след 1997 г. (вж. Стамев, 2009).*

*Бързият икономически растеж в периода 2004–2008 г. е придружен от изпреварващ темп на нарастване на банковите кредити за нефинансовите предприятия и домакинствата. През разглеждания период кредитите с натрупване нарастват с 37.7% средногодишно (средногеометрично), а като ниво на кредитно посредничество, т.е. като съотношение с БВП темпът на растеж е 18.9% средногодишно. Erdinç (2009) описва бързия кредитен растеж в България и Румъния в периода 1999–2006 г. като процес на догонване. От друга страна, бързият кредитен растеж може да се разглежда и като причина за формиране на дисбаланси, които в някакъв момент се материализират и поставят на изпитание финансовата система и икономиката. В тази логическа линия е изследването на Duenwald et al. (2005), които разглеждат кредитния бум в България, Румъния и Украйна. Използвайки база данни за различни банкови кризи, те обобщават, че в петте години преди рязкото променяне на възходящата динамика във финансовия сектор и икономиката съотношението на кредитите към БВП нараства средно с 5.2% годишно, след което започва да се понижава. Бързият кредитен растеж води до проблеми за банковия сектор по две направления – съответно макроикономически дисбаланси и последващо влошаване на качеството на кредитите (вж. пак там). След 2009 г. съотношението „кредити/БВП" в България започва да се понижава, като се потвърждава хипотезата, че с процеса на догонване са формирани дисбаланси, които се материализират и които изправят пред предизвикателства вземащите решения на микро- и макрониво.*

*В периода 2008–2012 г. кредитите в България нарастват средногодишно в номинално изражение с 2.7%, докато съотношението между кредитите и БВП се понижава с 0.2% средногодишно. Кредитите в българската банкова система нарастват в номинално изражение, като дори през най-*

*неблагоприятната за икономиката 2009 г. се наблюдава увеличаване на кредитните експозиции на банките. Нарастването през 2009 г. обаче се дължи до голяма степен на нетната покупка на отпуснатите в миналото кредити от ТБ, които възлизат на 1.5 млрд. лева. През следващите три години е налице обратната ситуация – нето кредитите нарастват по-бавно в отчетите на банковата система заради извършваните продажби на кредити и начисляването на обезценки, което води до намаляване на нетния им размер, стойности за който са представени в таблицата.*

Таблица 8

**СЪОТНОШЕНИЯ, САЛДА И НОВ БИЗНЕС ПО КРЕДИТИ ЗА ЧАСТНИЯ НЕФИНАНСОВ СЕКТОР**

| Година | Брой кредити | Кредити (с натрупване), в млн. лв. | Кредити (нов бизнес), в млн. лв. | Кредити (салда)/ кредити (нов бизнес), % | Кредити (нов бизнес)/ кредити (салда), % |
|---|---|---|---|---|---|
| 2008 | 3 019 504 | 48 348 | 21 947 | 53.4 | 59.9 |
| 2009 | 3 004 628 | 50 080 | 13 321 | 13.0 | 27.6 |
| 2010 | 2 763 350 | 50 692 | 12 581 | 4.9 | 25.1 |
| 2011 | 2 655 401 | 52 334 | 18 046 | 9.1 | 35.6 |
| 2012 | 2 734 408 | 53 808 | 18 513 | 8.0 | 35.4 |

Източници: БНБ, собствени изчисления.

*Обемът на новосключените кредити се характеризира с висока колебливост. През 2010 г. той се понижава с 43% спрямо 2008 г., след което започва частично да се възстановява. През 2012 г. новоотпуснатите кредити възлизат на 18.5 млрд. лева, което е с 15.6% под стойността от края на 2008 г. Подобна е динамиката и при броя на кредитите. В резултат от негативното икономическо развитие техният брой в системата започва да намалява след 2009 г., като към края на 2012 г. се понижава с 9.4% (спрямо 2009 г.), въпреки годишния 3% растеж през 2012 г.*

*Прирастът (номиналното годишно увеличение) на кредитите (салда) през 2010 г. съответства на 4.9% от новоотпуснатите през годината кредити, а през 2012 г. този показател нараства до 8% при 53.4% за 2008 г. Може да се обобщи, че в резултат от промяната в икономическата конюнктура намалява броят на кредитите, докато обемът на новосключените кредити гарантира минимален номинален растеж на кредитите с натрупване, т.е. част*

*от кредитите с настъпил падеж се заместват с кредити с по-голям номинал.[39] Обемът на новоотпуснатите банкови кредити успява да компенсира кредитите с настъпил падеж. Тази динамика сигнализира, че се увеличава обращаемостта на кредитите за сметка на техния матуритет, т.е. банките и техните клиенти не желаят да поемат по-дългосрочни ангажименти.*

*Заслужаваща внимание е динамиката на собствеността на активите. Местните банки увеличават дела си в активите на банковата система, като към 31.12.2012 г. контролират 26.5% от активите на банковата система спрямо 16.1% към края на 2008 г.[40] Местните банки са по-активни в условията на криза и имат основен принос за растежа на кредитите (в номинално изражение). Този процес вероятно се дължи на по-доброто познаване на икономическата обстановка в страната и на по-пълната информация, предоставяна за нуждите на местните клиенти, с която те разполагат. Към това, ако прибавим и проблемите на чуждестранните банкови централи, българският клиент възвръща доверието си в банковите институции с българско мажоритарно/контролно участие. Процесът на възстановяване на пазарния дял на местните банкови групи след навлизането на чуждестранни финансови институции на местния пазар е изследван. Съвсем нормално е вследствие на кризата някои от международните банкови групи да се разделят с българските си поделения, принудени от ликвидни и финансови проблеми на банката майка или поради промяна в условията за правене на бизнес в страната. Купувачи се оказват и местни лица, които са по-приспособими в новите условия и имат по-добри познания за местния бизнес.[41] Това от своя страна намалява въздействието на външните фактори върху системата, но увеличава риска от нарастване на експозициите (кредитни и депозитни) към свързани лица.*

*За периода от края на 2008 г. до края на 2012 г. кредитите за фирмите нарастват с 16% при 3.4% растеж на кредитите за домакинствата. Жилищните ипотечни кредити на физически лица нарастват с 15.5% за периода, а потребителските кредити се увеличават с минималните 0.6%. Овърдрафтът и другите*

[39] Този процес е подпомогнат от продажбата на вече отпуснати кредити от ТБ.
[40] Според данни от тримесечното издание на БНБ „Банките в България".
[41] Вж. Tschoegl, 2003 и Demirguc-Kunt and Huizinga, 1998.

*кредити на домакинствата бележат спад, но заради по-малкото им тегло нямат голямо влияние върху кредитите на домакинствата. Към края на 2012 г. 58.4% от кредитите и авансите са за нефинансовите предприятия и 28% за домакинствата, спрямо 56% и 30% за същия период на 2008 г. Българската банкова система, подобно на латвийската и литовската, се различава от тези на останалите седем страни, в които преобладаващ дял от кредита за нефинансовия частен сектор е насочен към домакинствата.*

*Бизнес моделът на банките в България е традиционен. Кредитите за частния нефинансов сектор преобладават в банковите активи, които се финансират основно с депозити на домакинствата и фирмите, докато външните пасиви, дължими главно към банките майки, имат намаляващо значение за финансирането на активите. За разлика от българската банкова система ТБ в останалите 9 държави, особено във Великобритания, Дания и Швеция, разчитат в по-голяма степен на финансовите пазари за финансиране на дейността си и за операции със и инвестиране на привлечените средства. Това поведение ги „имунизира" в по-голяма степен срещу икономическата динамика в страната, но ги прави подвластни на динамиката на международните дългови пазари. Опрощаването на вземания на кредиторите в Гърция и Кипър и дълговите проблеми на редица други страни в ЕС са показателни за измамните сигурност и ликвидност на дълговите пазари, доверието към които е много крехко и бързо може да се разруши.*

*За периода от края на 2008–2012 г. ТБ увеличават привлечените средства с 16%, депозитите на домакинствата нарастват с 62% до 35.9 млрд. лева, а тези на нефинансовите корпорации се увеличават с 11% до 22.1 млрд. лева. Впечатляващият растеж на депозитите на частния нефинансов сектор успява напълно да компенсира намалението на привлечените средства от кредитни институции, които се понижават с 35% през периода до 10.7 млрд. лева. Банките майки намаляват предоставените заеми на българските си поделения, но ТБ успяват да увеличат общия размер на привлечените средства и да повишат ликвидността си. В края на 2008 г. в отговор на кризата и с цел банките да управляват по-добре ликвидността си БНБ намалява нормата на ЗМР за всички привлечени средства от 12% на 10%. От 1 януари 2009 г. нормата на ЗМР се понижава от 10% на 5% за привлечените от банките средства от нерезиденти (банките майки основно), докато за привлечените държавни и общински средства не се начисляват ЗМР. От 1 октомври 2008 г.*

*БНБ признава за резервен актив 50% от касовите наличности на банките и улеснява достъпа до резервите им в БНБ. Това позволява на ТБ да погасят 1.3 млрд. лева задължения към банковите централи и свидетелства, че в пиковата за кризата 2009 г. ТБ не изпитват сериозни ликвидни проблеми. В допълнение към тези мерки ЦБ препоръча на ТБ да не разпределят дивиденти от печалбата за 2008 г., което, освен че доведе до нарастване на капиталовата база с 1.4 млрд. лева, способства за по-добрата ликвидност на системата. Благодарение на предприетите от ЦБ мерки се освобождава паричен ресурс за банките в размер на 3 млрд. лева.*[42]

*През 2012 г. системата е по-ликвидна и по-независима от външно финансиране спрямо 2008 г. Ликвидните позиции на банките се повишават значително, като делът на ликвидните активи в общите активи нараства до 23% към края на разглеждания период спрямо 16.8% към края на 2008 г. С 41% до 9.5 млрд. лева нарастват парите и паричните наличности при ЦБ, а вложенията в дългови инструменти – с 90%, до 9.3 млрд. лева. Нараства покритието на кредитите с депозити от фирмите и домакинствата, като 1 лев кредити за фирмите и домакинствата е покрит от 1.02 лева депозити на фирмите и домакинствата, при 0.85 лева депозитно покритие за всеки 1 лев кредит в края на 2008 г.*

*Банковата система не само е по-ликвидна през 2012 г. спрямо отправната 2008 г., но е и с по-висока капиталова адекватност. Коефициентът на обща капиталова адекватност нараства от 14.9% през 2008 г. до 17.6% през 2011 г. Показателят се понижава до 16.9% през 2012 г. заради промени в нормативната уредба, съгласно които ТБ формират специфични провизии за кредитен риск, които директно намаляват техния капитал и се трансформират в буфер при допълнително влошаване на качеството на кредитния портфейл. Абстрахирайки се от нормативните промени през 2012 г. капиталовата адекватност на банките би нараснала до около 20%, а адекватността на капитала от първи ред би нараснала до около 17%.*[43] *Съотношението на собствения капитал към активите нараства до 13.2% в края на 2012 г. (един лев СК финансира 7.6 лева активи) спрямо 11.4% в края на 2008 г. (един лев СК финансира 8.8 лева активи). Значително се повишава съотношението*

[42] Използвани са данни от годишната презентация на управителя на БНБ (Искров, 2009).

[43] Вж. Годишен отчет на БНБ за 2012 г.

*СК към кредита – от 13.9% към края на 2008 г. (един лев СК финансира 7.2 лева кредити и аванси) до 16.8% към края на 2012 г. (един лев СК финансира 6 лева кредити и аванси). Подобряването на капиталовата позиция през разглеждания период се дължи на увеличаването с 1.2 млрд. лева (46% растеж) на емитирания от ТБ капитал и в по-голяма степен на акумулираните резерви от натрупани печалби от предходни години, които нарастват с 2.2 млрд. лева, или с 62%.*

*През 2012 г. необслужваните кредити с просрочие повече от 90 дни нарастват до 9.6 млрд. лева и съответстват на 16.6% от брутните кредити (без кредитите за кредитни институции), докато през 2008 г. просрочените кредити с повече от 90 дни са в размер на 2.8% от брутните кредити. Трендът при необслужваните с повече от 90 дни кредити е възходящ, но темпът на растеж намалява, като през 2009 г., 2010 г. и 2011 г. този показател е съответно 6.4%, 11.9% и 14.9%. За забавянето на възходящата динамика принос има политиката на ТБ по продажба и отписване на просрочени кредити и по придобиване на обезпечения. Динамиката при лошите кредити е притеснителна, но до голяма степен тя е функция от икономическата среда. От друга страна, системата натрупва големи буфери за неутрализиране на ефектите от лошите кредити. В края на 2012 г. необслужваните повече от 90 дни кредити са покрити на 70.5% с провизии и обезценки (в размер 6.8 млрд. лева). В допълнение непокритата с провизии част от просрочените с повече от 90 дни кредити за 2012 г. е на стойност 2.9 млрд. лева, която съответства на 26.3% от СК на ТБ. Отделно за голяма част от кредитите са налични ликвидни обезпечения на стойност, по-висока от остатъчната стойност на вземането на ТБ. През 2011 г. БНБ удължава срока за реализацията на обезпеченията, което позволява на ТБ да постигнат по-висока цена на обезпечението, т.е. ще реинтегрират провизии.*

*Променя се валутната структура на активите и пасивите. През периода 2008–2012 г. валутният компонент намалява в привлечените средства (от 60.2% на 51.9%) най-вече заради по-високите лихви, които стопанските единици получават за депозираните в ТБ средства в левове и заради доверието във финансовата система и валутния борд. За сметка на това валутният компонент нараства при кредитите и авансите (от 60% на 65.4%) вероятно вследствие на търсенето на кредити с по-ниска лихва, деноминирани в чуждестранна валута (главно евро). Към 31.12.2012 г. 61.3% от*

*активите и 45 от пасивите са в чуждестранна валута, докато към 31.12.2008 г. валутните активи и пасиви са съответно 57% и 53%.*

Таблица 9

**ПРИХОДИ ОТ БАНКОВА ДЕЙНОСТ И ПОКАЗАТЕЛИ**

| | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо приходи от дейността (млн. лв.) | 3 710 | 3 792 | 3 932 | 3 914 | 3 816 |
| Административни разходи (% от НБД*) | 44.7 | 44.4 | 43.0 | 44.2 | 46.0 |
| Обезценка (% от НБД) | 8.9 | 27.4 | 33.5 | 33.0 | 31.7 |
| Нетна печалба (% от НБД) | 37.4 | 20.6 | 15.7 | 15.0 | 14.9 |

* НБД – нетен банков доход.

Източници: БНБ, собствени изчисления

*В резултат от негативната икономическа конюнктура рентабилността на ТБ се понижава значително. Нетната печалба през 2012 г. е с 59% под стойността от 2008 г. През 2012 г. нетният банков доход (НБД) нараства с 2.8% спрямо 2008 г., административните разходи са по-високи с 5.9%, но разходите за обезценка са с 266% над отчетените през 2008 г. Банките ограничават административните си разходи, така че да компенсират нарасналите разходи за обезценка, които от 8.9% от НБД през 2008 г. се повишават до 31.7% от НБД през 2012 г. Именно високият темп на нарастване на разходите за обезценка е причината нетната печалба да съответства на 14.9% от НБД спрямо 37.4% за 2008 г.*

*Въпреки кризата и изпреварващия растеж на разходите за обезценка през периода 2008–2012 г. българските ТБ успяват да генерират печалби. Благодарение и на положителните финансови резултати системата повишава капиталовата си база и възможността да абсорбира допълнителни загуби. БНБ препоръчва и успява да убеди банките да не разпределят дивиденти от печалбата за 2008 г., а резултатът е капитализиране на банковата система с 1.4 млрд. лева. ТБ са консервативни и през следващите години, като в голяма степен капитализират печалбите си.*

*Антицикличната и консервативната надзорна политика на ЦБ не позволява по време на кредитния бум да се стигне до още по-висок растеж на кредитите, когато ТБ са принудени да поддържат ЗМР и СК над средните за ЕС нива. Увеличаване на ЗМР, въвеждане на пределна норма на ЗМР за банките с растеж на кредитите, по-висок от възприетия бенчмарк, консервативна политика относно обезпеченията и рестриктивна лицензионна политика са само*

*част от мерките за охлаждане на бързия кредитен растеж и генерирането на буфери за бъдещи рискове. Благодарение на политиката на БНБ не се наложи банковата система да бъде спасявана с публични средства за разлика от системите на редица страни, включително някои от изследваните 10 държави. През 2008–2012 г. БНБ продължава антицикличната си политика, като в този период мерките са насочени към повишаване на ликвидността и по-добро управляване на рисковете от страна на ТБ.*

*В края на 2012 г. ТБ притежават по-добра ликвидна и капиталова позиция спрямо отправната 2008 г., когато българската икономика все още не е силно засегната от неблагоприятната международна финансова и икономическа конюнктура. Капацитетът на ТБ за кредитиране е голям, но слабото търсене на кредити, продиктувано от потиснатото вътрешно търсене в периода 2008–2012 г., не позволява по-отчетлив кредитен растеж. Разбира се, в резултат от кризата и влошаването на качеството на активите се засилва нежеланието на ТБ за поемане на риск и те стават по-взискателни към кредитополучателите и качеството на обезпеченията.*

## Оценяване на функциите на търсенето и предлагането на кредити

В тази част от изследването се оценяват иконометрично функциите на търсенето и предлагането на банкови кредити на частния нефинансов сектор в България, Латвия, Литва, Полша, Унгария и Чехия.[44] Използвани са публично достъпни тримесечни данни за страните – членки на ЕС, които не са членове на еврозоната, публикувани на интернет сайта на ЕЦБ, като за България е използван по-дълъг и всеобхватен динамичен ред от данни.[45] Първичните данни се изглаждат сезонно, след което с тях се провеждат тестове за наличието на единичен корен (разширен тест на Дики–Фулър и непараметричен тест на Филипс–Перон). Използваните входящи данни за моделите са

[44] Великобритания, Дания, Румъния и Швеция не са включени в изследването. Великобритания, Дания и Швеция са значително по-развити и се отличават в голяма степен от страните от ЦИЕ, а динамичният ред за Румъния не е достатъчно дълъг, за да се проведе коректно иконометрично изследване от гледна точка на статистическата значимост.

[45] Вж. Non-euro area EU countries, excluding the NCBs на www.ecb.europa.eu, както и www.bnb.bg.

стационарни при първите си разлики. Цел на иконометричната част от изследването е оценяването на функциите на търсенето и предлагането на кредити за избрани страни.

Функциите имат следния най-общ вид:

**Функция на търсенето на кредити: $Loans_D = f(r, p, EA, Supplementary)$**

**Функция на предлагането на кредити: $Loans_S = f(r, p, BS, Supplementary)$,** където:

**Loans** е изследваната кредитна променлива;

**r** – лихвеният процент по кредитите/депозитите;

**p** – инфлацията (потребителска или производствена);

**EA** – променливите за икономическата активност;

**BS** – специфичните за банките променливи (ликвидност, капиталова адекватност, нетен лихвен доход, печалби, съотношение между кредитите и депозитите);

**Supplementary** – допълнителни променливи, включени към уравненията на търсенето и предлагането на кредити, извън изброените основни (например индикатори за външния сектор, изкуствени (дъми) променливи, и др.).

От методологична гледна точка работата с нестационарни времеви редове изисква да се оперира с първите разлики на включените в регресията променливи (ако се окаже, че променливите не са стационарни при първите си разлики, се използват вторите разлики). Използван е двустепенният метод на Engle and Granger (1987) за работа с нестационарни редове.

След тестове за единичен корен нестационарните променливи се подлагат на коинтеграционен тест, като чрез метода на най-малките квадрати (МНМК) се проверява остатъкът на линейна регресия от нивата на изследваните променливи (първи етап). Проверява се дали остатъците – $u_t$ на тази регресия $Y_t = \beta_1 + \beta_i X_{it} + u_t$ са стационарни, като се използва разширеният тест на Дики и Фулър с критични стойности по таблицата на Davidson and McKinnon (1993). Ако нулевата хипотеза за наличието на единичен корен се отхвърли, се преминава към модела с коригираната грешка (втори етап) – извежда се динамичен модел, в който се включват остатъкът от първата регресия с един лаг (това представлява уравнението на коригираната грешка, което води модела към дългосрочно равновесие) и първите разлики на коинтеграционните променливи със съответен лаг в интервала (0; n).

**Първи етап** – проверява се хипотезата, че остатъкът – $\mathbf{u_t \sim I(0)}$ на регресията – $\mathbf{Y_t = \beta_1 + \beta_2 X_t + u_t}$, съставена от нестационарни променливи, е стационарен при нивата си, където:

$\mathbf{Y_t}$ е зависимата променлива;

$\beta_1$ – константата/дрифт;

$\beta_i$ – коефициентът пред **i**-тата обясняваща променлива;

$\mathbf{X_t}$; $\mathbf{u_t}$ – остатъци.

**Втори етап** – използва се моделът с коригирана грешка за

$$\Delta \mathbf{Y_t} = \beta_1 \Delta \mathbf{X_{t-n}} + \beta_2 \mathbf{u_{t-1}} + \varepsilon_t,$$

където:

$\Delta \mathbf{Y_t}$ са първите разлики на изследваната величина в период **t**;

$\Delta \mathbf{X_{t-n}}$ – първите разлики на регресора в период $\mathbf{t_{t-n}}$;

$\mathbf{u_{t-1}}$ – членът за коригираната грешка; $\mathbf{u_{t-1} = Y_{t-1} - \beta_1 - \beta_2 X_{t-n}}$

В таблици 12 и 13 в приложението са представени резултатите от иконометричното оценяване на функциите на търсенето и предлагането на кредити за седем избрани страни. Публикувани са само резултатите, при които вероятността коефициентът пред регресора да е равен на нула (вероятността за приемане на нулевата хипотеза на Т-теста) е по-малка от 10%.

**Модели на търсенето на кредити (резултати)**

Във всички модели на търсенето на кредити се изпълнява условието коефициентът пред члена за коригиране на грешката да е с отрицателен знак. По този начин с всяко следващо тримесечие динамичният модел се доближава до равновесното си състояние, т.е. проявява се коригиращият механизъм.

Във всичките шест коинтеграционни уравнения икономическата активност има силно положително влияние върху търсенето на кредити. В България, Латвия и Унгария е налице по-слаб принос на реалния БВП за търсенето на кредити, докато в Литва, Полша и Чехия е налице по-висок мултипликативен ефект на икономическата активност за търсенето на кредити. Заради по-голямото проникване на кредитите в икономиките на първите три страни и сравнително по-ниските стойности за втората група страни всеки допълнителен процент на увеличаване на реалното производство води до по-голям пределен ефект върху търсенето на кредити.[46]

[46] Съотношението на кредитите към БВП за периода 2008–2012 г. е 73% за Унгария, 72% за България и 87% за Латвия, докато в Полша, Чехия и Литва то възлиза през същия период на 50%, 51% и 59%.

Динамичните модели на търсенето на кредити в България, Латвия, Литва и Чехия потвърждават изводите от дългосрочните зависимости. Първите разлики на естествения логаритъм на реалния БВП оказват положително въздействие върху търсенето на кредити в краткосрочен период. Както в дългосрочен, така и в краткосрочен период икономическата активност е фактор с осезаемо положително влияние върху търсенето на кредити.

Три вида променливи са използвани за измерител на лихвената динамика – съответно лихвите по депозитите, лихвите по кредитите и шестмесечният *EURIBOR*. В Литва и Унгария лихвите по депозитите на частния нефинансов сектор имат положително въздействие върху дългосрочното търсене на кредити. Макар да не са често срещана променлива за обясняване на търсенето на кредити, в случая те са статистически значими както на ниво t-статистика, така и на ниво модел, т.е. F-статистика. Логично е лихвите по депозитите да са изразител на алтернативната цена на капитала и търсенето на кредити да е в обратна зависимост от тях. В резултатите се проявява точно обратната зависимост. Тази динамика може да се обясни с повишаването на лихвите по депозитите, които, като елемент на съвкупния доход, водят до по-висока увереност, респ. нараства търсенето на кредити, и обратно. Лихвите по депозитите в Литва и Унгария се понижават в периода след началото на кризата, който е съпроводен със стагниращa икономическа активност и намаляващ размер на кредитите на фирмите и домакинствата (с натрупване).

Първите разлики на лихвите по депозитите с лаг от три тримесечия имат негативен принос за моментното изменение на търсенето на кредити в Литва. Стопанските единици в настоящото тримесечие намаляват търсенето си на кредити в резултат от лаговото повишение на лихвите по депозитите (със забавяне от три тримесечия). В кратък период е налице проявлението на хипотезата за алтернативната цена на капитала, която се отъждествява от лихвите по депозитите.

В коинтеграционни зависимости за България, Латвия и Литва лихвите по кредитите имат дългосрочно негативно влияние върху търсенето на кредити. С повишаването на лихвите по кредитите намалява търсенето им при равни други условия. Размерът на коефициентите показва, че лихвите по кредитите имат далеч по-малко влияние от други индикатори, включени в регресията, като реалния БВП например.

Единствено при оценяването на функцията на търсенето на кредити в Чехия е използван шестмесечният *EURIBOR* като един от компонентите на цената на привлечения банков ресурс. Очаквано параметърът оказва негативно влияние върху търсенето на кредити.

Два индикатора са използвани за измерител на ценовото равнище – съответно ХИПЦ и индексът на производствената инфлация. В две от проучваните страни (Литва и Чехия) ХИПЦ е използван като променлива, която обяснява дисперсията в изследваната величина в дългосрочен период. В тези държави ХИПЦ има положително въздействие върху търсенето на кредити. Първото допускане за посоката на влияние е, че с нарастването на цените е налице преразпределяне на доход от кредитор към длъжник. Второто допускане относно посоката на влияние е, че с увеличаване на търсенето в икономиката се засилва инфлационният натиск, т.е. нарастващите цени сигнализират за по-висока увереност сред икономическите агенти. Разбира се, и обратната динамика е онагледена в упоменатите дотук емпирични изследвания по тези проблеми.

В модела за Чехия първите разлики на естествения логаритъм от потребителските цени влияят положително върху изменението на кредитната променлива. Размерът на коефициента пред параметъра свидетелства, че в краткосрочен период изменението на ХИПЦ оказва силно стимулиращо влияние върху търсенето на кредити.

Производствената инфлация е променливата за равнището на цените, включена във функцията на търсенето на кредити в България.[47] Освен че е статистически значим, параметърът за производствената инфлация се включва добре в модела, който е с висока обясняваща стойност и обща статистическа значимост. Коефициентът пред този параметър се включва в коинтеграционното уравнение с отрицателен знак.[48] Производствената инфлация оказва неблагоприятно влияние върху търсенето на кредити от фирмите поради намаляването на нетните им парични потоци. С оглед на факта, че фирмените кредити са преобладаващи в кредитния портфейл на ТБ в страната,

[47] За България е използван по-дълъг динамичен ред и по-голям набор от променливи заради по-добрата обезпеченост с данни.

[48] В изследването на Égert et al. (2007) производствената инфлация влияе отрицателно върху дисперсията на изследваната кредитната променлива в страните от Югоизточна Европа.

поскъпването на факторите на производството намалява свободните финансови средства, откъдето спада и желанието за получаване на допълнителни банкови кредити. Освен това производствената инфлация се прехвърля в определена пропорция и върху крайните цени. Резултатите от динамичния модел показват, че лаговата стойност на изменението на производствената инфлация в България (със забавяне от три тримесечия) има негативно влияние върху търсенето на кредити.

В България, Латвия и Полша съотношението на кредитите към депозитите на частния нефинансов сектор има положително влияние върху търсенето на кредити. Показателят разкрива желанието за поемане на риск от страна на икономическите агенти, като повишението му води до нарастване на търсенето на кредити. Валидна е и обратната хипотеза – понижението на показателя показва нежелание за поемане на рискове. И от дескриптивния анализ е видно, че до началото на кризата се наблюдава тенденция на повишаване на показателя, след което рязко се променя желанието за поемане на риск, респ. възходящата тенденция преди кризата се пречупва.

Два показателя за външния сектор се включват добре като независими променливи. Коинтеграционните уравнения показват, че салдото по текущата сметка е с положителен принос за търсенето на кредити в Латвия и Полша, макар и с по-слабо влияние, отколкото останалите регресори. С увеличаване на външното търсене нараства търсенето на кредити, т.е. експортноориентираните сектори и свързаните с тях контрагенти и заети са повлияни в положителна степен от износа при търсенето на кредити.

Брутната външна задлъжнялост в Унгария добре се включва сред променливите в коинтеграционното уравнение, обясняващи търсенето на кредити. Брутният външен дълг е индикатор за желанието за поемане на риск в икономиката. Възходящият тренд при търсенето на чуждестранен привлечен ресурс съответства на нарастване на търсенето на кредити в страната, и обратно. Брутната външна задлъжнялост обаче има негативен принос за търсенето на кредити в краткосрочен период в Унгария, което се различава от резултатите от коинтеграционното уравнение. Параметърът е статистически значим и се включва добре в динамичния модел на търсенето на кредити. Повишаването на брутната външна задлъжнялост води до повишаване на общата

задлъжнялост и вероятно от рационални подбуди, т.е. заради очаквания за промяна в конюнктурата икономическите агенти намаляват търсенето си на кредити в краткосрочен период.[49]

Други променливи, които от иконометрична гледна точка са фактори за кредитната динамика, са депозитите на фирмите, лаговите стойности на изследваната променлива и дъми променливите.

Депозитите на фирмите и домакинствата в България имат положително влияние върху търсенето на кредити. С нарастване на депозитите през продължителен период нараства и търсенето на кредити, като това по-скоро потвърждава допускането, че кредитите се ползват от икономически агенти с повишаващи се финансови възможности.

Лаговите стойности на изследваната променлива са част от регресорите в динамичните модели на търсенето на кредити. Първите разлики на тримесечните лагови стойности на кредитите за частния сектор имат положително влияние върху търсенето на кредити в Полша и Унгария. Величината на коефициентите пред лаговите стойности е показателна за силното положително влияние на изменението едно и две тримесечия по-рано върху търсенето на кредити, т.е. налице е инерционност.

Тримесечието, през което възходящата икономическа динамика в Латвия, Литва и Полша се обръща, свидетелства за наличието на структурно прекъсване. Коефициентите пред дъми променливите са с отрицателен знак, но размерът им по-скоро доказва, че значението им за динамичния модел на търсенето на кредити не е голямо.

Приложените иконометрични модели за оценяване функциите на търсенето на кредити притежават добра обяснителна стойност, като коригираният коефициент на детерминация е със стойност в диапазона между 0.61 и 0.92, при средна стойност за шестте държави от 0.76, т.е. чрез така формулираните модели се обясняват средно 76% от дисперсията в изследваната променлива. Остатъците на динамичните модели успешно преминават

[49] В динамичните модели е често срещано коефициентът пред лаговата стойност на първите разлики в регресорите да се различава от този в коинтеграционното уравнение, което може да се тълкува, че в дългосрочен и в краткосрочен период поведението на икономическите агенти се влияе в различна степен от едни и същи фактори.

тестовете за серийна корелация – Breusch-Godfrey Serial Correlation LM теста, за наличието на хетероскедастичност – ARCH теста, и за нормалност на разпределението – Jarque-Bera теста. Въпреки по-ниските от 2 стойности на DW-статистиката, съответно 1.69 и 1.75 за България и Литва, Breusch-Godfrey Serial Correlation LM тестът показва, че с висока степен на вероятност не е налице нито положителна, нито отрицателна серийна корелация. Скалата на DW-статистиката е от 0 до 4, така че резултатите са с приемливо отклонение.

**Модели на предлагането на кредити (резултати)**

За всичките шест модела на предлагането на кредити е изпълнено условието коефициентът пред члена за коригиране на грешката да е с отрицателна стойност. По този начин се проявява коригиращият механизъм, който с всяко следващо тримесечие намалява отклонението на модела от равновесното му състояние.

Съотношенията „банков капитал/активи", „банков капитал/кредити" и „банкови ликвидни активи/активи" се използват често като променлива, обясняваща предлагането на кредити във всичките шест страни.

Първите разлики на показателите „капитал/активи" и „ликвидни активи/общи активи" с нулев лаг имат отрицателно влияние върху предлагането на кредити от страна на българските ТБ. Същата посока на влияние е валидна и в коинтеграционното уравнение, изразител на по-дългосрочната зависимост. Размерът на коефициентите пред двете променливи показва, че те имат голямо влияние върху дисперсията в изследваната величина. ТБ увеличават ликвидността и капиталовата си адекватност, генерирайки буфери за непредвидени промени в икономическата конюнктура, т.е. това поведение на ТБ се асоциира с нежелание за поемане на рискове и при равни други условия влияе негативно върху кредитния растеж.

Естественият логаритъм от показателя „ликвидни активи/общи активи" има отрицателно влияние върху предлагането на кредити в дълъг период в шест от изследваните страни (с изключение на България). В динамичните модели на Латвия и Чехия първите разлики на естествения логаритъм на показателя на ликвидните активи към общите активи с нулев лаг имат негативен принос за дисперсията на изследваната величина, т.е. моментното понижение на ликвидността има положително влияние върху моментното

изменение на кредитите. В динамичните модели за Литва и Полша първите разлики на показателя за ликвидността с лаг от едно тримесечие имат положителен принос за моментното изменение на кредитите. Налице е разминаване между посоката на влияние на показателя в дълъг и в кратък срок, което може да бъде обяснено с различното поведение и бизнес модела на ТБ в дълъг и кратък период.

Разбира се, възможно е капиталовата адекватност и ликвидността да имат положителен принос за предлагането на кредити. В изследване за страните от Латинска Америка Montoro и Rojas-Suarez (2012) извеждат положителна връзка между капиталовата адекватност и предлагането на кредити, както и между ликвидността и предлагането на кредити. В този случай ТБ увеличават капиталовата си адекватност и ликвидността си, за да увеличат кредитирането.

С повишаването на съотношението „капитал/кредити" намалява предлагането на кредити. Тази зависимост е дългосрочна и е валидна за предлагането на кредити в Полша и Чехия.

Лихвените проценти по кредитите, депозитите и лихвите на междубанковия пазар са друга група променливи, включени във функциите на предлагането на кредити.

Лихвите по кредитите влияят положително върху предлагането на кредити в Чехия. Това разкриват резултатите от коинтеграционната зависимост и от динамичния модел (използвани са първите разлики на лихвите по кредитите за фирмите и домакинствата с нулев лаг). Такава е и очакваната посока на влияние, т.е. с нарастване на лихвите по кредитите ТБ увеличават кредитната си експозиция, мотивирани от по-високите лихвени приходи. В обратна пропорция е влиянието на лихвите по кредитите в динамичния модел и в коинтеграционното уравнение за Полша, което може да бъде обяснено с нежеланието за кредитиране след определено оптимално равнище, водещо до нарастване на необслужваните кредити (вж. Stiglitz and Weiss, 1988).

Друга група променливи, включващи се добре във функциите на предлагането на кредити, е съотношението „външни пасиви/собствен капитал".[50] Външните пасиви са един от източниците на финансиране на активите, респ. на кредитите, и е съвсем логично

[50] Външните пасиви представляват задължения на ТБ към нерезиденти.

с нарастването им да се увеличава кредитирането при равни други условия. Коинтеграционните уравнения на предлагането на кредити за Литва и Унгария показват, че с нарастване на съотношението „външни пасиви/капитал" ТБ увеличават предлагането на кредити. Тази посока на влияние е съвсем очаквана, но индикаторът е показателен и за желанието за поемане на риск, като е налице правопропорционална зависимост.

Лихвите по депозитите и междубанковите лихви имат дългосрочно отрицателно влияние върху предлагането на кредити в Латвия и Чехия. Очаквано цената на привлечения ресурс оказва ограничаващо влияние върху предлагането на кредити при равни други условия. Нетният лихвен доход, получен като разлика между лихвените приходи и лихвените разходи на ТБ, има положителен принос за предлагането на кредити в България.[51] Това се потвърждава от зависимостите в коинтеграционното уравнение и в динамичния модел. Резултатите са в рамките на очакваното, тъй като е нормално поведението на ТБ да се влияе в положителна степен от нетния паричен поток, елемент на който е нетният лихвен приход.

Цените са често срещана променлива, която се разглежда като фактор при изследване на предлагането на кредити. Инфлацията, измерена чрез ХИПЦ, има положителен принос за дългосрочното уравнение на предлагането на кредити в Латвия и Унгария. Първите разлики с нулев лаг за Латвия и Унгария показват, че и в краткосрочен период е налице положително влияние на крайните цени върху предлагането на кредити.[52]

Друга променлива, която се включва добре в регресията, е индексът на строителната продукция. Коинтеграционното уравнение за България показва, че с нарастване на строителната продукция нараства и предлагането на кредити.[53] Сектор „строителство" се развива добре и повишава резултатите си, което мотивира ТБ да отпускат кредити поради по-

[51] Единствено за България е наличен такъв динамичен ред и затова не е проверена зависимостта спрямо променливата „нетен лихвен доход" за уравненията на предлагането на кредити за другите страни.

[52] De Mello and Pisu (2009) и Guo and Stepanyan (2011) получават аналогични резултати за посоката на влияние на инфлацията върху предлагането на кредити.

[53] Индексът на строителната продукция се използва само в уравненията за България, тъй като променливата не е налична за останалите държави поради ограничеността на базата данни, с която се работи в изследването.

благоприятните перспективи пред сектора, които са функция от цените на имотите.

Брутната външна задлъжнялост се включва добре в дългосрочното уравнение на предлагането на кредити в Литва. С нарастването на външния дълг, част от който е на ТБ, банките увеличават кредитния си капацитет, откъдето разширяват и кредитния си портфейл при равни други условия. Нарастването на брутния външен дълг е синоним на повишаващо се доверие към местната икономика от страна на чуждестранните кредитори.

Подобно на резултатите от уравненията на търсенето на кредити, дъми променливите за кризата имат негативно влияние върху предлагането на кредити. В пет от шестте изследвани страни (с изключение на България), е налице такова проявление. Коефициентите пред дъми параметъра са с малки стойности, което е доказателство, че те оказват влияние върху предлагането на кредити, но другите фактори са по-значими за дисперсията в предлагането на кредити.

Представените динамични модели с коригиращ механизъм притежават добра обяснителна стойност, съдейки от стойностите на коригираните коефициенти на детерминация, които варират в диапазона 0.51–0.95 за шестте страни (със средна стойност от 0.75). Тестовете на остатъка показват, че с висока степен на вероятност не са налице автокорелация и хетероскедастичност, както и че с висока степен на вероятност се приема хипотезата за нормалност на разпределението на остатъка. DW-статистиката за уравненията на предлагане на кредити в Латвия, Унгария и Чехия се отклонява по-значително от бенчмарка (от 2), но тестът на Breusch-Godfrey отхвърля нулевата хипотеза за наличието на серийна корелация.

## Заключение

Дескриптивният и иконометричният анализ показват, че икономическата активност е основният фактор за кредитната динамика. Търсенето на кредити се влияе в най-голяма степен от изменението на реалната икономическа активност, докато дескриптивният анализ показва, че усещането за риск сред банките е високо заради възходящата динамика на класифицираните кредити и низходящата динамика на рентабилността.

В края на 2012 г. банките са по-добре капитализирани, по-ликвидни, с нараснали провизии спрямо 2008 г. – преди пика на кризата през 2009 г., но кредитирането дори се понижава в някои страни. Силният икономически спад и последвалото недостатъчно икономическо възстановяване в Латвия, Литва, Румъния и Унгария имат основен принос за негативната динамика на кредитния пазар. На обратната територия се развиват икономиките на Чехия, Полша и Швеция, в които икономическият растеж провокира повишено търсене на кредити, а ниските нива на класифицираните кредити и генерираните капиталови и ликвидни буфери стимулират предлагането на кредити.

След настъпването на кризата проличава кои централни банки оценяват правилно рисковете и кои ги подценяват. Недостатъчните капиталови (ниски нива на коефициента на ливъридж и на капиталова адекватност) и ликвидни буфери преди кризата изправят редица банкови системи пред сериозни изпитания. В немалко от разгледаните страни се използват нетрадиционни мерки и публичен ресурс, за да се предотврати материализирането на системни банкови рискове, както и за поддържане стабилността, доверието и ликвидността в системата.

За да се задвижи по-отчетливо кредитирането, с което да се стимулират съвкупните разходи, е необходимо подобряване на икономическата среда, което е свързано с реформи и структурни промени, както и подобряване на международната конюнктура. Видно е, че консервативната парична политика не е за подценяване и в критични моменти спомага за съхраняване на публични ресурси и за предотвратяване на системни проблеми. В това отношение ЦБ трябва да бъдат непоколебими при осъществяването на антицикличната си политика, особено по време на възходящата част от бизнес цикъла.

# Приложения

Таблица 10

## ИЗБРАНИ ПОКАЗАТЕЛИ ЗА ФИНАНСОВИЯ СЕКТОР И ИКОНОМИКАТА

**България** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 28.4 | 29.4 | 31.0 | 31.7 | 33.3 |
| Кредити на нефинансовия частен сектор | 25.1 | 26.1 | 26.4 | 27.2 | 28.1 |
| Некапиталови ценни книжа | 1.9 | 1.7 | 2.0 | 2.3 | 2.9 |
| Парични средства и други активи | 1.3 | 1.2 | 1.5 | 1.7 | 2.1 |
| Външни активи | 3.9 | 4.1 | 4.1 | 4.6 | 5.1 |
| Общо депозити | 21.2 | 21.9 | 24.2 | 26.8 | 28.7 |
| Депозити на нефинансовия частен сектор | 19.6 | 20.6 | 22.5 | 25.3 | 27.4 |
| Капитал и резерви | 4.1 | 4.8 | 5.1 | 5.3 | 5.5 |
| Външни пасиви | 9.4 | 8.7 | 7.5 | 6.4 | 6.9 |
| Общо активи | 36.8 | 38.0 | 40.1 | 42.2 | 45.4 |
| Външни пасиви/активи (%) | 25.6 | 23.0 | 18.8 | 15.1 | 15.2 |
| Кредити за частния нефинансов сектор/активи (%) | 68.2 | 68.7 | 65.8 | 64.6 | 61.8 |
| БВП, по цени от 2005 г. | 28.0 | 26.4 | 26.5 | 27.0 | 27.2 |
| Брутен външен дълг/БВП (%) | 105.1 | 108.3 | 102.7 | 94.1 | 94.8 |
| ХИПЦ | 131.2 | 133.4 | 139.3 | 142.2 | 146.1 |
| Инфлация (%) | 3.3 | 0.5 | 2.3 | 2.8 | 2.4 |

**Великобритания** (млрд. евро)

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 3 618.8 | 4 144.4 | 4 051.8 | 4 192.7 | 4 405.6 |
| Кредити на нефинансовия частен сектор | 2 730.7 | 2 817.3 | 2 945.7 | 2 901.2 | 2 983.9 |
| Некапиталови ценни книжа | 425.6 | 407.1 | 428.2 | 423.8 | 340.9 |
| Парични средства и други активи | 282.9 | 264.8 | 272.9 | 312.6 | 256.7 |
| Външни активи | 4 070.4 | 3 738.6 | 4 023.0 | 4 400.2 | 4 177.9 |
| Общо депозити | 3 298.9 | 3 725.5 | 3 710.9 | 3 870.4 | 4 003.0 |
| Депозити на нефинансовия частен сектор | 2 331.8 | 2 561.9 | 2 773.3 | 2 789.3 | 2 907.8 |
| Капитал и резерви | 532.3 | 651.6 | 709.1 | 828.9 | 887.4 |
| Външни пасиви | 3 851.7 | 3 393.5 | 3 591.6 | 3 923.8 | 3 684.8 |
| Общо активи | 8 727.5 | 8 958.9 | 9 175.0 | 9 731.5 | 9 559.1 |
| Външни пасиви/активи (%) | 44.1 | 37.9 | 39.1 | 40.3 | 38.5 |
| Кредити за частния нефинансов сектор/активи (%) | 31.3 | 31.4 | 32.1 | 29.8 | 31.2 |
| БВП, по цени от 2005 г. | 1 944.4 | 1 867.2 | 1 900.8 | 1 919.6 | 1 924.9 |
| Брутен външен дълг/БВП (%) | 442.8 | 414.5 | 413.1 | 425.4 | 415.0 |
| ХИПЦ | 109.5 | 112.6 | 116.8 | 121.7 | 125.0 |
| Инфлация (%) | 3.1 | 2.8 | 3.7 | 4.2 | 2.7 |

**Дания** (млрд. евро)

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 601.0 | 616.7 | 633.0 | 627.4 | 638.5 |
| Кредити на нефинансовия частен сектор | 499.9 | 490.2 | 495.9 | 489.6 | 487.5 |
| Некапиталови ценни книжа | 184.3 | 238.0 | 238.4 | 225.9 | 240.3 |
| Парични средства и други активи | 103.1 | 68.0 | 76.7 | 111.4 | 96.6 |
| Външни активи | 176.2 | 153.9 | 158.3 | 148.6 | 148.1 |
| Общо депозити | 301.8 | 277.5 | 280.7 | 280.9 | 291.2 |
| Депозити на нефинансовия частен сектор | 162.2 | 162.8 | 162.3 | 159.9 | 165.0 |
| Капитал и резерви | 60.5 | 60.9 | 62.3 | 58.2 | 61.1 |
| Външни пасиви | 194.2 | 196.6 | 186.8 | 173.5 | 175.7 |
| Общо активи | 1 091.1 | 1 105.0 | 1 138.2 | 1 144.9 | 1 157.6 |
| Външни пасиви/активи (%) | 17.8 | 17.8 | 16.4 | 15.2 | 15.2 |
| Кредити за частния нефинансов сектор/активи (%) | 45.8 | 44.4 | 43.6 | 42.8 | 42.1 |
| БВП, по цени от 2005 г. | 216.1 | 203.8 | 207.1 | 209.4 | 208.4 |
| Брутен външен дълг/БВП (%) | 176.3 | 188.9 | 190.5 | 183.3 | 182.7 |
| ХИПЦ | 107.3 | 108.6 | 111.6 | 114.3 | 116.5 |
| Инфлация (%) | 2.4 | 1.2 | 2.8 | 2.4 | 1.9 |

**Латвия** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 22.9 | 21.2 | 20.3 | 18.6 | 17.4 |
| Кредити на нефинансовия частен сектор | 20.6 | 19.1 | 17.5 | 16.3 | 14.6 |
| Некапиталови ценни книжа | 1.5 | 0.7 | 0.7 | 0.6 | 0.7 |
| Парични средства и други активи | 0.8 | 1.0 | 1.1 | 1.2 | 1.0 |
| Външни активи | 6.8 | 6.7 | 7.7 | 8.4 | 8.8 |
| Общо депозити | 9.8 | 9.0 | 9.6 | 8.9 | 9.5 |
| Депозити на нефинансовия частен сектор | 7.4 | 7.5 | 8.2 | 8.1 | 8.4 |
| Капитал и резерви | 2.4 | 2.3 | 2.3 | 2.3 | 2.7 |
| Външни пасиви | 18.0 | 15.0 | 15.0 | 13.7 | 13.8 |
| Общо активи | 32.3 | 30.0 | 30.4 | 29.5 | 28.6 |
| Външни пасиви/активи (%) | 55.7 | 49.9 | 49.5 | 46.6 | 48.5 |
| Кредити за частния нефинансов сектор/активи (%) | 63.6 | 63.4 | 57.6 | 55.2 | 51.0 |
| БВП, по цени от 2005 г. | 15.2 | 12.5 | 12.4 | 13.0 | 13.7 |
| Брутен външен дълг/БВП (%) | 130.1 | 156.5 | 164.8 | 145.0 | 136.2 |
| ХИПЦ | 137.8 | 135.9 | 139.2 | 144.6 | 146.9 |
| Инфлация (%) | 10.4 | -1.4 | 2.4 | 3.9 | 1.6 |

**Литва** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 21.7 | 19.7 | 19.1 | 18.9 | 18.6 |
| Кредити на нефинансовия частен сектор | 20.2 | 18.4 | 17.2 | 16.0 | 16.1 |
| Некапиталови ценни книжа | 0.7 | 1.0 | 1.1 | 1.1 | 1.1 |
| Парични средства и други активи | 0.6 | 0.9 | 1.0 | 0.9 | 0.9 |
| Външни активи | 3.2 | 4.3 | 4.0 | 3.3 | 3.2 |
| Общо депозити | 10.7 | 11.5 | 12.8 | 12.4 | 13.5 |
| Депозити на нефинансовия частен сектор | 10.3 | 10.9 | 11.8 | 12.0 | 12.8 |
| Капитал и резерви | 2.3 | 3.0 | 3.4 | 3.3 | 3.3 |
| Външни пасиви | 12.2 | 10.4 | 8.6 | 7.8 | 6.8 |
| Общо активи | 26.5 | 26.2 | 25.7 | 24.7 | 24.4 |
| Външни пасиви/активи (%) | 45.9 | 39.8 | 33.5 | 31.7 | 27.8 |
| Кредити за частния нефинансов сектор/активи (%) | 76.0 | 70.3 | 66.9 | 64.9 | 66.2 |
| БВП, по цени от 2005 г. | 25.5 | 21.8 | 22.1 | 23.4 | 24.2 |
| Брутен външен дълг/БВП (%) | 71.0 | 83.9 | 83.2 | 77.8 | 75.4 |
| ХИПЦ | 124.5 | 125.9 | 130.5 | 135.0 | 139.0 |
| Инфлация (%) | 8.5 | 1.2 | 3.6 | 3.5 | 2.9 |

**Полша** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 174.4 | 191.9 | 217.7 | 217.0 | 249.5 |
| Кредити на нефинансовия частен сектор | 150.1 | 162.9 | 182.3 | 184.4 | 204.8 |
| Некапиталови ценни книжа | 42.7 | 49.5 | 59.2 | 56.3 | 63.1 |
| Парични средства и други активи | 20.3 | 11.6 | 11.5 | 12.9 | 15.5 |
| Външни активи | 14.5 | 9.1 | 10.3 | 11.6 | 12.6 |
| Общо депозити | 160.1 | 174.3 | 193.9 | 190.2 | 221.8 |
| Депозити на нефинансовия частен сектор | 138.5 | 154.8 | 175.0 | 174.9 | 201.4 |
| Капитал и резерви | 28.2 | 36.3 | 42.0 | 40.7 | 50.0 |
| Външни пасиви | 41.8 | 42.1 | 49.5 | 49.4 | 47.7 |
| Общо активи | 262.6 | 274.0 | 311.5 | 309.7 | 354.7 |
| Външни пасиви/активи (%) | 15.9 | 15.4 | 15.9 | 16.0 | 13.4 |
| Кредити за частния нефинансов сектор/активи (%) | 57.2 | 59.4 | 58.5 | 59.5 | 57.8 |
| БВП, по цени от 2005 г. | 291.1 | 295.8 | 307.2 | 321.1 | 327.5 |
| Брутен външен дълг/БВП (%) | 56.8 | 59.4 | 66.4 | 71.7 | 70.8 |
| ХИПЦ | 109.4 | 113.6 | 116.9 | 122.2 | 124.9 |
| Инфлация (%) | 3.3 | 3.8 | 2.9 | 4.5 | 2.2 |

**Румъния** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 71.0 | 66.1 | 67.0 | 68.4 | 65.3 |
| Кредити на нефинансовия частен сектор | 49.3 | 47.1 | 49.1 | 51.6 | 50.9 |
| Некапиталови ценни книжа | 2.8 | 8.4 | 11.8 | 13.9 | 15.5 |
| Парични средства и други активи | 6.2 | 6.2 | 6.5 | 4.1 | 4.7 |
| Външни активи | 1.7 | 3.0 | 3.0 | 2.3 | 2.6 |
| Общо депозити | 42.1 | 46.1 | 46.4 | 47.9 | 49.9 |
| Депозити на нефинансовия частен сектор | 38.0 | 39.8 | 41.9 | 43.5 | 44.7 |
| Капитал и резерви | 9.0 | 10.3 | 12.9 | 14.7 | 16.4 |
| Външни пасиви | 25.7 | 22.5 | 24.1 | 24.1 | 21.1 |
| Общо активи | 84.5 | 86.4 | 91.2 | 91.8 | 91.2 |
| Външни пасиви/активи (%) | 30.4 | 26.0 | 26.4 | 26.3 | 23.1 |
| Кредити за частния нефинансов сектор/активи (%) | 58.3 | 54.6 | 53.9 | 56.2 | 55.8 |
| БВП, по цени от 2005 г. | 97.8 | 92.0 | 90.9 | 92.7 | 93.4 |
| Брутен външен дълг/БВП(%) | 56.0 | 68.6 | 75.7 | 77.2 | 74.6 |
| ХИПЦ | 123.7 | 129.5 | 139.8 | 144.2 | 150.8 |
| Инфлация (%) | 6.4 | 4.7 | 7.9 | 3.2 | 4.6 |

**Унгария** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 83.2 | 81.2 | 81.1 | 74.1 | 69.3 |
| Кредити на нефинансовия частен сектор | 67.5 | 64.1 | 64.4 | 56.5 | 52.6 |
| Некапиталови ценни книжа | 22.0 | 29.4 | 27.8 | 25.4 | 30.0 |
| Парични средства и други активи | 5.0 | 2.4 | 0.3 | -0.1 | -0.8 |
| Външни активи | 14.0 | 13.9 | 13.2 | 12.0 | 9.7 |
| Общо депозити | 59.7 | 63.3 | 60.4 | 56.8 | 59.6 |
| Депозити на нефинансовия частен сектор | 48.6 | 48.4 | 47.1 | 44.1 | 47.6 |
| Капитал и резерви | 9.4 | 10.4 | 9.9 | 8.9 | 10.0 |
| Външни пасиви | 33.8 | 31.7 | 30.5 | 26.3 | 20.6 |
| Общо активи | 128.0 | 130.4 | 125.9 | 114.5 | 111.6 |
| Външни пасиви/активи (%) | 26.4 | 24.3 | 24.2 | 23.0 | 18.5 |
| Кредити за частния нефинансов сектор/активи (%) | 52.7 | 49.1 | 51.1 | 49.3 | 47.1 |
| БВП, по цени от 2005 г. | 93.1 | 86.9 | 88.1 | 89.5 | 87.9 |
| Брутен външен дълг/БВП (%) | 123.2 | 144.9 | 144.8 | 147.7 | 127.9 |
| ХИПЦ | 119.0 | 125.4 | 131.2 | 136.6 | 143.5 |
| Инфлация (%) | 3.4 | 5.4 | 4.6 | 4.1 | 5.1 |

**Чехия** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 88.7 | 96.0 | 104.6 | 106.8 | 110.5 |
| Кредити на нефинансовия частен сектор | 70.0 | 71.6 | 78.2 | 80.1 | 84.3 |
| Некапиталови ценни книжа | 23.6 | 27.7 | 30.9 | 33.0 | 38.4 |
| Парични средства и други активи | 12.0 | 9.2 | 8.5 | 10.5 | 10.0 |
| Външни активи | 25.9 | 22.3 | 24.0 | 22.6 | 25.2 |
| Общо депозити | 101.8 | 109.4 | 118.6 | 122.3 | 132.2 |
| Депозити на нефинансовия частен сектор | 90.9 | 95.9 | 104.5 | 106.2 | 114.3 |
| Капитал и резерви | 14.7 | 17.0 | 19.4 | 19.7 | 22.2 |
| Външни пасиви | 16.4 | 13.5 | 15.4 | 15.3 | 13.7 |
| Общо активи | 157.1 | 161.8 | 175.3 | 180.4 | 191.7 |
| Външни пасиви/активи (%) | 10.5 | 8.3 | 8.8 | 8.5 | 7.2 |
| Кредити за частния нефинансов сектор/активи (%) | 44.6 | 44.3 | 44.6 | 44.4 | 44.0 |
| БВП, по цени от 2005 г. | 122.0 | 116.6 | 119.3 | 121.5 | 120.1 |
| Брутен външен дълг/БВП (%) | 48.5 | 51.4 | 56.3 | 59.7 | 60.5 |
| ХИПЦ | 111.1 | 111.7 | 114.3 | 117.5 | 120.3 |
| Инфлация (%) | 3.3 | 0.5 | 2.3 | 2.8 | 2.4 |

**Швеция** **(млрд. евро)**

| Години | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|
| Общо кредити | 487.0 | 527.0 | 613.9 | 633.0 | 686.1 |
| Кредити на нефинансовия частен сектор | 364.2 | 396.7 | 483.2 | 512.8 | 549.8 |
| Некапиталови ценни книжа | 74.4 | 94.8 | 84.1 | 86.2 | 83.2 |
| Парични средства и други активи | 103.5 | 66.2 | 83.8 | 98.1 | 97.9 |
| Външни активи | 215.7 | 218.9 | 249.5 | 287.1 | 301.6 |
| Общо депозити | 298.4 | 307.4 | 337.1 | 338.2 | 377.9 |
| Депозити на нефинансовия частен сектор | 163.0 | 178.8 | 222.2 | 238.1 | 264.6 |
| Капитал и резерви | 42.0 | 53.0 | 61.7 | 65.3 | 72.1 |
| Външни пасиви | 216.8 | 206.3 | 215.4 | 236.6 | 230.9 |
| Общо активи | 907.5 | 936.3 | 1 068.1 | 1 140.6 | 1 213.4 |
| Външни пасиви/активи (%) | 23.9 | 22.0 | 20.2 | 20.7 | 19.0 |
| Кредити за частния нефинансов сектор/активи (%) | 40.1 | 42.4 | 45.2 | 45.0 | 45.3 |
| БВП, по цени от 2005 г. | 320.4 | 304.5 | 323.5 | 335.8 | 339.4 |
| Брутен външен дълг/БВП (%) | 206.2 | 210.6 | 190.5 | 195.3 | 188.9 |
| ХИПЦ | 107.0 | 110.0 | 112.3 | 112.8 | 113.9 |
| Инфлация (%) | 2.1 | 2.8 | 2.1 | 0.4 | 1.0 |

Източници: ЕЦБ, собствени изчисления.

Таблица 11

**ЛИХВЕНА ДИНАМИКА ПРИ КРЕДИТИТЕ И ДЕПОЗИТИТЕ ПРЕДИ, ПО ВРЕМЕ И СЛЕД СТРУКТУРНОТО ПРЕКЪСВАНЕ**

**България**

| Лихвени проценти (%, дата) по: | Т 1* | Т 2** | Т 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 8.46 (2007-01) | 10.55 (2009-01) | 7.16 (2012-12) |
| Фирмени кредити от 1 до 5 г. | 9.69 (2007-03) | 11.43 (2008-12) | 8.54 (2012-12) |
| Фирмени кредити над 5 г. | 9.43 (2007-03) | 11.80 (2008-11) | 8.88 (2012-12) |
| Ипотечни кредити на ФЛ до 1 г. | 10.25 (2008-02) | 13.63 (2010-04) | 7.75 (2012-07) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 9.75 (2007-01) | 11.35 (2008-12) | 7.93 (2012-12) |
| Ипотечни кредити на ФЛ над 5 г. | 8.59 (2007-02) | 9.81 (2008-12) | 8.73 (2012-12) |
| Потребителски кредити на ФЛ до 1 г. | 12.99 (2007-09) | 15.49 (2010-05) | 14.65 (2012-12) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 12.30 (2007-11) | 13.53 (2008-12) | 12.51 (2012-12) |
| Потребителски кредити на ФЛ над 5 г. | 10.13 (2007-08) | 12.09 (2008-12) | 11.41 (2012-12) |
| Фирмени депозити над 2 г. | 0.96 (2007-07) | 5.00 (2009-09) | 3.29 (2010-10) |
| Фирмени депозити до 2 г. | 3.67 (2007-06) | 6.23 (2009-08) | 4.19 (2012-08) |
| Депозити на ФЛ над 2 г. | 6.68 (2007-07) | 7.27 (2009-12) | 6.84 (2012-03) |
| Депозити на ФЛ до 2 г. | 4.29 (2007-04) | 7.31 (2009-11) | 4.97 (2012-12) |

**Великобритания**

| Лихвени проценти (%, дата) по: | Т 1* | Т 2** | Т 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 5.33 (2004-01) | 7.69 (2007-12) | 2.69 (2009-11) |
| Фирмени кредити от 1 до 5 г. | 5.68 (2004-01) | 6.67 (2007-12) | 4.12 (2012-12) |
| Фирмени кредити над 5 г. | 6.02 (2004-01) | 6.59 (2008-02) | 5.04 (2009-11) |
| Ипотечни кредити на ФЛ до 1 г. | 4.66 (2004-02) | 6.46 (2008-09) | 4.34 (2010-08) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 4.73 (2004-01) | 5.73 (2008-12) | 4.30 (2012-12) |
| Ипотечни кредити на ФЛ над 5 г. | 5.48 (2006-08) | 5.75 (2008-11) | 5.41 (2012-12) |
| Потребителски кредити на ФЛ до 1 г. | 6.94 (2006-09) | 6.63 (2008-10) | 4.48 (2011-06) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 8.92 (2006-10) | 10.12 (2009-09) | 10.39 (2011-12) |
| Потребителски кредити на ФЛ над 5 г. | 8.29 (2007-12) | 8.93 (2009-11) | 9.09 (2010-04) |
| Фирмени депозити над 2 г. | 4.61 (2004-02) | 5.46 (2008-11) | 3.04 (2012-03) |
| Фирмени депозити до 2 г. | 3.56 (2004-02) | 5.78 (2007-12) | 0.80 (2010-01) |
| Депозити на ФЛ над 2 г. | 4.05 (2004-05) | 6.78 (2008-08) | 3.66 (2012-02) |
| Депозити на ФЛ до 2 г. | 3.81 (2004-01) | 5.73 (2008-10) | 2.64 (2010-12) |

**Дания**

| Лихвени проценти (%, дата) по: | Т 1* | Т 2** | Т 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 4.19 (2005-11) | 7.23 (2008-11) | 3.48 (2012-12) |
| Фирмени кредити от 1 до 5 г. | 4.35 (2006-01) | 7.50 (2008-11) | 4.06 (2012-12) |
| Фирмени кредити над 5 г. | 4.44 (2006-07) | 5.60 (2008-11) | 2.63 (2012-12) |
| Ипотечни кредити на ФЛ до 1 г. | 5.25 (2005-09) | 8.37 (2008-11) | 3.83 (2010-10) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 5.72 (2005-10) | 8.72 (2008-11) | 6.02 (2010-11) |
| Ипотечни кредити на ФЛ над 5 г. | 4.56 (2005-11) | 5.92 (2008-11) | 3.15 (2012-12) |
| Потребителски кредити на ФЛ до 1 г. | 7.18 (2005-12) | 9.76 (2008-11) | 6.51 (2010-06) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 7.27 (2006-01) | 9.69 (2008-11) | 6.52 (2010-12) |
| Потребителски кредити на ФЛ над 5 г. | 6.89 (2006-01) | 9.55 (2008-11) | 6.14 (2010-12) |
| Фирмени депозити над 2 г. | 1.99 (2003-10) | 5.18 (2008-05) | 1.68 (2010-10) |
| Фирмени депозити до 2 г. | 2.09 (2003-10) | 5.35 (2008-11) | 0.87 (2010-10) |
| Депозити на ФЛ над 2 г. | 1.34 (2005-10) | 4.12 (2008-11) | 1.38 (2010-12) |
| Депозити на ФЛ до 2 г. | 1.62 (2005-09) | 5.02 (2008-11) | 1.48 (2011-03) |

**Латвия**

| Лихвени проценти (%, дата) по: | T 1* | T 2** | T 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 5.66 (2005-11) | 21.10 (2009-06) | 2.65 (2012-12) |
| Фирмени кредити от 1 до 5 г. | 5.98 (2005-11) | 17.96 (2009-06) | 4.06 (2012-11) |
| Фирмени кредити над 5 г. | 5.60 (2005-11) | 12.00 (2009-06) | 3.75 (2012-11) |
| Ипотечни кредити на ФЛ до 1 г. | 6.25 (2005-12) | 52.23 (2010-04) | 2.18 (2012-04) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 5.76 (2005-12) | 13.45 (2009-08) | 4.38 (2011-10) |
| Ипотечни кредити на ФЛ над 5 г. | 3.46 (2012-12) | 11.82 (2009-07) | 3.46 (2012-12) |
| Потребителски кредити на ФЛ до 1 г. | 11.00 (2004-04) | 24.63 (2011-03) | 23.02 (2012-10) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 10.62 (2004-08) | 21.12 (2011-02) | 17.26 (2012-11) |
| Потребителски кредити на ФЛ над 5 г. | 5.83 (2007-01) | 16.68 (2009-08) | 7.80 (2012-12) |
| Фирмени депозити над 2 г. | 4.62 (2006-04) | 7.25 (2009-08) | 2.17 (2012-12) |
| Фирмени депозити до 2 г. | 2.95 (2005-11) | 17.67 (2009-06) | 0.83 (2012-12) |
| Депозити на ФЛ над 2 г. | 4.95 (2006-08) | 11.16 (2010-06) | 4.36 (2012-12) |
| Депозити на ФЛ до 2 г. | 3.59 (2006-04) | 11.4 (2009-12) | 1.49 (2012-12) |

**Литва**

| Лихвени проценти (%, дата) по: | T 1* | T 2** | T 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 4.61 (2005-12) | 8.52 (2009-06) | 2.81 (2012-12) |
| Фирмени кредити от 1 до 5 г. | 4.89 (2005-12) | 9.04 (2009-05) | 4.04 (2012-11) |
| Фирмени кредити над 5 г. | 4.58 (2005-10) | 9.32 (2009-07) | 4.06 (2012-12) |
| Ипотечни кредити на ФЛ до 1 г. | 3.91 (2005-11) | 11.99 (2009-04) | 0.93 (2011-06) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 4.21 (2005-12) | 8.54 (2009-01) | 3.75 (2012-12) |
| Ипотечни кредити на ФЛ над 5 г. | 4.10 (2005-12) | 8.23 (2009-08) | 3.00 (2012-12) |
| Потребителски кредити на ФЛ до 1 г. | 6.27 (2005-05) | 11.38 (2009-09) | 6.47 (2012-12) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 7.95 (2007-04) | 12.01 (2010-09) | 11.08 (2012-12) |
| Потребителски кредити на ФЛ над 5 г. | 4.86 (2006-01) | 10.28 (2009-08) | 4.07 (2012-12) |
| Фирмени депозити над 2 г. | 1.53 (2005-04) | 6.02 (2009-07) | 3.46 (2012-12) |
| Фирмени депозити до 2 г. | 2.29 (2005-10) | 8.16 (2009-01) | 1.23 (2012-12) |
| Депозити на ФЛ над 2 г. | 3.66 (2005-11) | 8.19 (2010-02) | 3.87 (2012-12) |
| Депозити на ФЛ до 2 г. | 2.59 (2005-11) | 8.36 (2009-10) | 1.32 (2012-12) |

**Полша**

| Лихвени проценти (%, дата) по: | T 1* | T 2** | T 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 5.79 (2007-03) | 7.74 (2008-11) | 5.76 (2009-04) |
| Фирмени кредити от 1 до 5 г. | 5.79 (2007-03) | 7.96 (2008-11) | 5.97 (2009-04) |
| Фирмени кредити над 5 г. | 5.86 (2007-04) | 7.41 (2008-12) | 5.41 (2009-10) |
| Ипотечни кредити на ФЛ до 1 г. | 6.12 (2006-06) | 9.47 (2008-12) | 6.52 (2011-03) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 5.59 (2007-05) | 8.06 (2008-12) | 6.75 (2011-01) |
| Ипотечни кредити на ФЛ над 5 г. | 5.61 (2007-05) | 7.91 (2008-12) | 5.83 (2010-07) |
| Потребителски кредити на ФЛ до 1 г. | 11.78 (2006-12) | 14.29 (2008-10) | 12.9 (2009-11) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 11.12 (2006-12) | 13.71 (2010-02) | 13.34 (2011-04) |
| Потребителски кредити на ФЛ над 5 г. | 8.03 (2006-12) | 11.41 (2008-11) | 10.44 (2011-04) |
| Фирмени депозити над 2 г. | 2.64 (2007-05) | 4.30 (2009-01) | 2.48 (2009-10) |
| Фирмени депозити до 2 г. | 3.63 (2006-12) | 5.97 (2008-12) | 3.58 (2010-08) |
| Депозити на ФЛ над 2 г. | 3.01 (2007-04) | 3.29 (2008-04) | 2.10 (2012-08) |
| Депозити на ФЛ до 2 г. | 2.73 (2006-05) | 6.48 (2009-02) | 3.99 (2011-01) |

**Румъния**

| Лихвени проценти (%, дата) по: | T 1* | T 2** | T 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 11.42 (2007-08) | 19.69 (2009-02) | 8.92 (2012-04) |
| Фирмени кредити от 1 до 5 г. | 11.91 (2007-09) | 19.17 (2009-03) | 9.38 (2012-05) |
| Фирмени кредити над 5 г. | 10.98 (2007-10) | 17.89 (2009-03) | 10.2 (2012-07) |
| Ипотечни кредити на ФЛ до 1 г. | 7.92 (2007-05) | 16.7 (2010-05) | 8.22 (2012-05) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 12.73 (2008-09) | 15.02 (2010-06) | 8.44 (2012-10) |
| Ипотечни кредити на ФЛ над 5 г. | 9.62 (2008-01) | 11.4 (2010-01) | 8.30 (2012-08) |
| Потребителски кредити на ФЛ до 1 г. | 19.95 (2008-07) | 22.72 (2009-03) | 13.76 (2012-05) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 15.38 (2008-01) | 19.18 (2009-05) | 14.12 (2012-08) |
| Потребителски кредити на ФЛ над 5 г. | 12.77 (2008-01) | 16.53 (2009-07) | 12.71 (2012-05) |
| Фирмени депозити над 2 г. | 3.06 (2007-07) | 5.44 (2009-03) | 2.74 (2011-10) |
| Фирмени депозити до 2 г. | 6.38 (2007-08) | 16.05 (2009-02) | 4.94 (2012-04) |
| Депозити на ФЛ над 2 г. | 6.73 (2007-09) | 13.92 (2009-01) | 4.49 (2012-12) |
| Депозити на ФЛ до 2 г. | 6.57 (2007-10) | 14.13 (2009-04) | 5.38 (2012-12) |

**Унгария**

| Лихвени проценти (%, дата) по: | Т 1* | Т 2** | Т 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 7.97 (2006-04) | 13.44 (2008-11) | 8.46 (2010-10) |
| Фирмени кредити от 1 до 5 г. | 8.46 (2006-03) | 13.45 (2009-06) | 8.71 (2010-08) |
| Фирмени кредити над 5 г. | 7.85 (2006-05) | 12.01 (2009-01) | 8.07 (2010-08) |
| Ипотечни кредити на ФЛ до 1 г. | 6.82 (2007-06) | 11.11 (2009-08) | 8.49 (2011-02) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 12.66 (2008-05) | 13.07 (2009-09) | 9.90 (2012-12) |
| Ипотечни кредити на ФЛ над 5 г. | 10.30 (2007-10) | 12.34 (2009-06) | 10.88 (2011-12) |
| Потребителски кредити на ФЛ до 1 г. | 18.85 (2005-11) | 30.02 (2010-08) | 29.01 (2011-09) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 19.10 (2008-05) | 24.75 (2009-09) | 21.73 (2011-09) |
| Потребителски кредити на ФЛ над 5 г. | 13.01 (2007-06) | 18.06 (2010-01) | 15.42 (2012-12) |
| Фирмени депозити над 2 г. | 4.70 (2006-05) | 6.55 (2008-11) | 3.40 (2012-12) |
| Фирмени депозити до 2 г. | 5.15 (2005-12) | 10.58 (2008-11) | 4.91 (2010-07) |
| Депозити на ФЛ над 2 г. | 3.36 (2005-12) | 4.77 (2008-11) | 2.87 (2010-03) |
| Депозити на ФЛ до 2 г. | 4.69 (2006-03) | 10.14 (2009-01) | 4.55 (2010-10) |

**Чехия**

| Лихвени проценти (%, дата) по: | Т 1* | Т 2** | Т 3*** |
|---|---|---|---|
| Фирмени кредити до 1 г. | 3.39 (2004-02) | 5.63 (2008-07) | 2.83 (2012-12) |
| Фирмени кредити от 1 до 5 г. | 3.83 (2005-10) | 5.85 (2008-11) | 3.37 (2012-12) |
| Фирмени кредити над 5 г. | 4.58 (2006-04) | 5.78 (2008-11) | 3.56 (2012-12) |
| Ипотечни кредити на ФЛ до 1 г. | 4.03 (2005-06) | 8.68 (2010-08) | 4.88 (2012-12) |
| Ипотечни кредити на ФЛ от 1 до 5 г. | 6.09 (2007-03) | 6.36 (2008-09) | 5.62 (2012-07) |
| Ипотечни кредити на ФЛ над 5 г. | 4.80 (2007-06) | 5.22 (2009-09) | 4.56 (2012-12) |
| Потребителски кредити на ФЛ до 1 г. | 10.33 (2004-02) | 17.01 (2009-09) | 16.49 (2012-07) |
| Потребителски кредити на ФЛ от 1 до 5 г. | 12.59 (2007-06) | 13.82 (2009-07) | 13.06 (2012-12) |
| Потребителски кредити на ФЛ над 5 г. | 9.18 (2004-08) | 9.89 (2009-12) | 9.22 (2012-12) |
| Фирмени депозити над 2 г. | 1.54 (2008-06) | 2.84 (2008-08) | 1.65 (2011-11) |
| Фирмени депозити до 2 г. | 1.38 (2005-07) | 3.30 (2008-07) | 0.76 (2010-12) |
| Депозити на ФЛ над 2 г. | 1.99 (2008-08) | 2.30 (2009-03) | 1.95 (2012-12) |
| Депозити на ФЛ до 2 г. | 0.88 (2004-04) | 2.52 (2008-07) | 1.44 (2011-03) |

**Швеция**

| Лихвени проценти (%, дата) по: | Т 1* | Т 2** | Т 3*** |
|---|---|---|---|
| **Фирмени кредити до 1 г.** | 2.67 (2005-11) | 6.08 (2008-09) | 1.79 (2010-01) |
| **Фирмени кредити от 1 до 5 г.** | 4.09 (2006-04) | 4.78 (2008-09) | 3.52 (2010-06) |
| **Фирмени кредити над 5 г.** | 4.89 (2006-05) | 5.09 (2008-09) | 4.19 (2010-05) |
| **Ипотечни кредити на ФЛ до 1 г.** | 2.65 (2005-12) | 6.01 (2008-09) | 1.55 (2010-01) |
| **Ипотечни кредити на ФЛ от 1 до 5 г.** | 4.09 (2006-09) | 4.72 (39782) | 3.67 (2012-12) |
| **Ипотечни кредити на ФЛ над 5 г.** | 4.99 (2007-10) | 5.03 (2008-09) | 4.80 (2012-12) |
| **Потребителски кредити на ФЛ до 1 г.** | 3.68 (2005-12) | 6.85 (2008-09) | 2.48 (2010-02) |
| **Потребителски кредити на ФЛ от 1 до 5 г.** | 4.15 (2006-09) | 4.78 (2008-11) | 3.87 (2012-12) |
| **Потребителски кредити на ФЛ над 5 г.** | 5.00 (2007-03) | 5.07 (2008-10) | 4.79 (2009-10) |
| **Фирмени депозити над 2 г.** | - | - | - |
| **Фирмени депозити до 2 г.** | 0.97 (2005-11) | 4.55 (2008-09) | 0.48 (2010-02) |
| **Депозити на ФЛ над 2 г.** | 1.80 (2005-12) | 4.44 (2008-09) | 1.70 (2009-07) |
| **Депозити на ФЛ до 2 г.** | 0.55 (2005-08) | 4.14 (2008-11) | 0.51 (2010-04) |

* Т 1 – минимум в периода преди структурното прекъсване във финансовата система, определено чрез пречупването в тенденцията при лихвените проценти. Периодите са различни за различните страни поради техните индивидуални особености. Максималната дължина на период 1 е 5 години, т.е. не повече от 5 години от максимума, предизвикан от структурното прекъсване във финансовата система и икономиката на всяка от разгледаните 10 страни.

** Т 2 – максимум в периода на структурното прекъсване.

*** Т 3 – минимум в последващия период на структурното прекъсване.

Източници: ЕЦБ, собствени изчисления.

Таблица 12

**ДИНАМИЧЕН МОДЕЛ НА ТЪРСЕНЕТО НА КРЕДИТИ С ЧЛЕН ЗА КОРИГИРАНЕ НА ГРЕШКАТА**

| Динамичен модел на предлагане на кредити | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | България | | | Латвия | | | Литва | | |
| | Зависима променлива | Δ(log(loans)) | | | Δ(log(loans)) | | | Δ(log(loans)) | | |
| | Регресори (независими пром.) | Коеф. | t-стат. | p-val. | t-стат. | Коеф. | p-val. | Коеф. | t-стат. | p-val. |
| | constant | 0.01 | 3.3 | 0.00 | 0.09 | 7.22 | 0.00 | 0.12 | 8.65 | 0.00 |
| | ECT(-1) | -0.37 | -3.51 | 0.00 | -0.07 | -2.05 | 0.05 | -0.24 | -2.95 | 0.01 |
| | Δ(log(yr)) | 0.84 | 3.89 | 0.00 | 0.42 | 2.61 | 0.01 | 0.31 | 1.66 | 0.11 |
| | Δ(rd) | | | | | | | | | |
| | D(rd(-3)) | | | | | | | -0.03 | -1.75 | 0.09 |
| | Δ(log(p)) | | | | | | | | | |
| | Δ (log(pi(-3))) | -0.31 | -2.44 | 0.02 | | | | | | |
| | Δ(log(extdtoy)) | | | | | | | | | |
| | Δ(catoy) | | | | | | | | | |
| | Δ(ctod) | 0.86 | 12.04 | 0.00 | | | | | | |
| | Δ(log(ctod)) | | | | 0.43 | 2.65 | 0.01 | | | |
| | Δ (log(dep)) | 0.67 | 11.64 | 0.00 | | | | | | |
| | Δ(log(loans(-1))) | | | | | | | | | |
| | Δ(log(loans(-2))) | | | | | | | | | |
| | trend | | | | 0.00 | -1.83 | 0.08 | 0.00 | -2.58 | 0.02 |
| | dummy | | | | -0.05 | -2.70 | 0.01 | -0.06 | -2.72 | 0.01 |
| | Период | 2001Q1 - 2012Q4 | | | 2004Q2 - 2012Q4 | | | 2005Q4 - 2012Q4 | | |
| | Брой променливи (коригирани) | 48 | | | 35 | | | 29 | | |
| | R2 adj. | 0.92 | | | 0.88 | | | 0.80 | | |
| | F-Stat. | 115.72 | | | 50.42 | | | 23.91 | | |
| | DW stat. | 1.69 | | | 2.23 | | | 1.75 | | |
| | Тестове на остатъка | вероят. за прием. H0 | | | вероят. за прием. H0 | | | вероят. за прием. H0 | | |
| | Breusch-Godfrey Ser. Corr. LM test | 40% (3 лага) | | | 87% (4 лага) | | | 66% (4 лага) | | |
| | ARCH Test | 30% (3 лага) | | | 23$ (4 лага) | | | 77% (4 лага) | | |
| | Jarque-Bera Test | 0.34 | | | 0.1 | | | 0.2 | | |

(продължава)

(продължение)

| Коинтеграционно уравнение, включено в модела | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Зависима променлива | ECT (България) | | | ECT (Латвия) | | | ECT (Литва) | | |
| | log(loans) | | | log(loans) | | | log(loans) | | |
| Регресори (независими пром.) | Коеф. | t-стат. | p-val. | t-стат. | Коеф. | p-val. | Коеф. | t-стат. | p-val. |
| constant | -7.03 | -5.19 | 0.00 | -13.6 | -4.71 | 0.00 | -22.6 | -13.7 | 0.00 |
| log(yr) | 1.53 | 7.13 | 0.00 | 2.75 | 7.46 | 0.00 | 3.12 | 12.73 | 0.00 |
| rl | -0.01 | -2.81 | 0.01 | -0.06 | -4.62 | 0.00 | -0.10 | -5.00 | 0.00 |
| rd | | | | | | | 0.26 | 9.97 | 0.00 |
| eurbr6m | | | | | | | | | |
| log(p) | | | | | | | 0.99 | 5.60 | 0.00 |
| log(pi) | -0.87 | -7.79 | 0.00 | | | | | | |
| ctod | 0.84 | 15.25 | 0.00 | | | | | | |
| log(ctod) | | | | 1.95 | 8.15 | 0.00 | | | |
| log(dep) | 0.54 | 7.18 | 0.00 | | | | | | |
| log(extdtoy) | | | | | | | | | |
| catoy | | | | 0.02 | 7.92 | 0.00 | | | |
| trend | 0.02 | 10.44 | 0.00 | | | | | | |
| Период | 2001Q1 - 2012Q4 | | | 2004Q2 - 2012Q4 | | | 2004Q4 - 2012Q4 | | |

(продължава)

(продължение)

| Динамичен модел на предлагане на кредити | | Полша | | | Унгария | | | Чехия | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Зависима променлива | Δ(log(loans)) | | | Δ(log(loans)) | | | Δ(log(loans)) | | |
| | Регресори (независими пром.) | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. |
| | constant | 0.05 | 4.27 | 0.00 | | | | 0.04 | 3.73 | 0.00 |
| | ECT(-1) | -0.33 | -3.17 | 0.00 | -0.15 | -2.36 | 0.02 | -0.44 | -3.59 | 0.00 |
| | Δ(log(yr)) | | | | | | | 1.10 | 2.56 | 0.02 |
| | Δ(rd) | | | | | | | | | |
| | D(rd(-3)) | | | | | | | | | |
| | Δ(log(p)) | | | | | | | 2.19 | 3.26 | 0.00 |
| | Δ (log(pi(-3))) | | | | | | | | | |
| | Δ(log(extdtoy)) | | | | -0.19 | -2.61 | 0.01 | | | |
| | Δ(catoy) | -0.01 | -2.68 | 0.01 | | | | | | |
| | Δ(ctod) | | | | | | | | | |
| | Δ(log(ctod)) | -0.41 | -1.93 | 0.06 | | | | | | |
| | Δ (log(dep)) | | | | | | | | | |
| | Δ(log(loans(-1))) | 0.36 | 2.56 | 0.02 | 0.55 | 4.56 | 0.00 | | | |
| | Δ(log(loans(-2))) | | | | 0.41 | 3.30 | 0.00 | | | |
| | trend | | | | | | | 0.00 | -2.97 | 0.01 |
| | dummy | -0.04 | -3.12 | 0.00 | | | | | | |
| | Период | 2004Q3 - 2012Q4 | | | 2003Q4 - 2012Q4 | | | 2004Q2 - 2012Q4 | | |
| | Брой променливи (коригирани) | 34 | | | 37 | | | 35 | | |
| | R2 adj. | 0.61 | | | 0.68 | | | 0.64 | | |
| | F-Stat. | 11.43 | | | | | | 16.38 | | |
| | DW stat. | 2.21 | | | 1.95 | | | 1.87 | | |
| | Тестове на остатъка | вероят. за прием. H0 | | | вероят. за прием. H0 | | | вероят. за прием. H0 | | |
| | Breusch-Godfrey Ser. Corr. LM test | 69% (4 лага) | | | 51% (4 лага) | | | 72% (3 лага) | | |
| | ARCH Test | 84% (4 лага) | | | 71% (4 лага) | | | 92% (2лага) | | |
| | Jarque-Bera Test | 0.14 | | | 0.85 | | | 0.48 | | |

(продължава)

(продължение)

| Коинтеграционно уравнение, включено в модела | Зависима променлива | ECT (Полша) | | | ECT (Унгария) | | | ECT (Чехия) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | log(loans) | | | log(loans) | | | log(loans) | | |
| | Регресори (независими пром.) | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. |
| | constant | -49.1 | -5.58 | 0.00 | -19.4 | -7.43 | 0.00 | -63.2 | -13.0 | 0.00 |
| | log(yr) | 5.49 | 6.85 | 0.00 | 2.64 | 9.91 | 0.00 | 4.80 | 14.35 | 0.00 |
| | rl | | | | | | | | | |
| | rd | | | | 0.03 | 3.90 | 0.00 | | | |
| | eurbr6m | | | | | | | -0.09 | -6.96 | 0.00 |
| | log(p) | | | | | | | 5.47 | 9.59 | 0.00 |
| | log(pi) | | | | | | | | | |
| | ctod | | | | | | | | | |
| | log(ctod) | 0.55 | 3.49 | 0.00 | | | | | | |
| | log(dep) | | | | | | | | | |
| | log(extdtoy) | | | | 0.79 | 21.48 | 0.00 | | | |
| | catoy | 0.01 | 1.72 | 0.10 | | | | | | |
| | trend | -0.02 | -2.92 | 0.01 | | | | -0.03 | -5.82 | 0.00 |
| | Период | 2004Q1 - 2012Q4 | | | 2003Q1 - 2012Q4 | | | 2004Q1 - 2012Q4 | | |
| | Брой променливи | 36 | | | 40 | | | 36 | | |

където: **constant** – константа; **trend** – времеви тренд; **ECT** – член за коригиране на грешката; Δ – първи разлики на променливата; **(-1), (-2), (-n)** – брой лагове, измерени в тримесечия; **dummy** – дъми променлива за структурното прекъсване, предизвикано от кризата, като за всяка страна СП е между първото и четвъртото тримесечие на 2008 г., измерено през промяната в реалния тримесечен БВП; **log(yr)** – естествен (натурален) логаритъм от реалния БВП; **log(p)** – естествен (натурален) логаритъм от хармонизирания индекс на потребителските цени; **log(pi)** – естествен (натурален) логаритъм от индекса на производствените цени; **rl** – лихви по кредитите на нефинансовите фирми и домакинствата (дългосрочни и краткосрочни); **rd** – лихви по депозитите на нефинансовите фирми и домакинствата (дългосрочни и краткосрочни); **eurbr6m** – 6-месечен EURIBOR; **pribor6m** – 6-месечен междубанков лихвен процент в Чехия; **ctod** – съотношение между кредитите и депозитите на частния нефинансов сектор; **log(ctod)** – естествен логаритъм на съотношението кредити към депозити; **log(dep)** – естествен логаритъм на депозитите на частния нефинансов сектор (стойност с натрупване); **catoy** – съотношение между салдото по текущата сметка и БВП; **log(extdtoy)** – брутен външен дълг към БВП; **log(constr)** – естествен логаритъм на индекса на строителната продукция.

Таблица 13

**ДИНАМИЧЕН МОДЕЛ НА ПРЕДЛАГАНЕТО НА КРЕДИТИ С ЧЛЕН ЗА КОРИГИРАНЕ НА ГРЕШКАТА**

| Динамичен модел на предлагане на кредити | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | България | | | Латвия | | | Литва | | |
| | Зависима променлива | Δ(log(loans)) | | | Δ(log(loans)) | | | Δ(log(loans)) | | |
| | Регресори (независими пром.) | Коеф. | t-стат. | p-val. | t-стат. | Коеф. | p-val. | Коеф. | t-стат. | p-val. |
| | constant | 0.01 | 2.18 | 0.03 | 0.06 | 6.51 | 0.00 | 0.08 | 16.66 | 0.00 |
| | ECT(-1) | -0.76 | -4.90 | 0.00 | -0.26 | -2.65 | 0.01 | -0.67 | -7.45 | 0.00 |
| | Δ(log(netii)) | 0.48 | 5.06 | 0.00 | | | | | | |
| | Δ(cap) | -3.46 | -3.70 | 0.00 | | | | | | |
| | Δ(liq) | -1.07 | -4.79 | 0.00 | | | | | | |
| | Δ(log(liq)) | | | | -0.41 | -4.22 | 0.00 | | | |
| | Δ(log(liq(-1))) | | | | | | | 0.10 | 2.21 | 0.04 |
| | Δ(rl_fnh(-1)) | | | | | | | | | |
| | Δ(rl_fnh(-2)) | | | | | | | | | |
| | Δ(rl_cz_fnh) | | | | | | | | | |
| | Δlog(log(p)) | | | | 1.10 | 3.65 | 0.00 | | | |
| | Δ(log(extlbtocap)) | | | | | | | 0.40 | 8.35 | 0.00 |
| | Δ(log(loans(-1))) | | | | | | | | | |
| | Δ(log(loans(-2))) | 0.21 | 2.51 | 0.02 | | | | | | |
| | trend | | | | | | | | | |
| | dummy | | | | -0.07 | -7.4 | 0 | -0.06 | -9.23 | 0.00 |
| | Период | 2000Q4 - 2012Q4 | | | 2004Q2 - 2012Q4 | | | 2005Q2 - 2012Q4 | | |
| | Брой променливи | 49 | | | 35 | | | 31 | | |
| | R2 adj. | 0.72 | | | 0.89 | | | 0.95 | | |
| | F-Stat. | 26.10 | | | 66.49 | | | 134.98 | | |
| | DW stat. | 1.98 | | | 2.38 | | | 2.23 | | |
| | Тестове на остатъка | вероят. за прием. H0 | | | вероят. за прием. H0 | | | вероят. за прием. H0 | | |
| | Breusch-Godfrey Ser. Corr. LM test | 90% (4 лага) | | | 53% (4 лага) | | | 37% (4 лага) | | |
| | ARCH Test | 75% (4 лага) | | | 57% (4 лага) | | | 32% (4 лага) | | |
| | Jarque-Bera Test | 31% | | | 31% | | | 48% | | |

(продължава)

(продължение)

| Коинтеграционно уравнение, включено в модела | | ECT (България) | | | ECT (Латвия) | | | ECT (Литва) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Зависима променлива | log(loans) | | | log(loans) | | | log(loans) | | |
| | Регресори (независими пром.) | Коеф. | t-стат. | p-val. | t-стат. | Коеф. | p-val. | Коеф. | t-стат. | p-val. |
| | constant | 6.56 | 17.71 | 0.00 | | | | 3.67 | 9.54 | 0.00 |
| | log(netii) | 0.40 | 4.94 | 0.00 | | | | | | |
| | cap | -1.59 | -2.70 | 0.01 | | | | | | |
| | log(captoloans) | | | | | | | | | |
| | liq | -1.71 | -9.75 | 0.00 | | | | | | |
| | log(liq) | | | | -1.51 | -28.5 | 0.00 | -0.33 | -3.19 | 0.00 |
| | rl | | | | | | | | | |
| | pribor6m | | | | | | | | | |
| | rd | | | | -0.02 | -2.67 | 0.01 | | | |
| | log(extlbtocap) | | | | | | | 0.51 | 8.65 | 0.00 |
| | log(p) | | | | 1.63 | 127.8 | 0.00 | | | |
| | log(constr) | 0.28 | 4.85 | 0.00 | | | | | | |
| | log(extdtoy) | | | | | | | 1.06 | 11.48 | 0.00 |
| | trend | 0.02 | 15.86 | 0.00 | | | | 0.02 | 6.28 | 0.00 |
| | Период | 2001Q1 - 2012Q4 | | | 2004Q1 - 2012Q4 | | | 2004Q4 - 2012Q4 | | |
| | Брой променливи | 52 | | | 36 | | | 33 | | |

(продължава)

(продължение)

| Динамичен модел на предлагане на кредити | Зависима променлива | Полша Δ(log(loans)) | | | Унгария Δ(log(loans)) | | | Чехия Δ(log(loans)) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Регресори (независими пром.) | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. |
| | constant | 0.04 | 3.97 | 0.00 | 0.02 | 1.95 | 0.06 | 0.04 | 7.56 | 0.00 |
| | ECT(-1) | -0.38 | -6.07 | 0.00 | -0.11 | -2.26 | 0.03 | -0.47 | -3.27 | 0.00 |
| | Δ(log(netii)) | | | | | | | | | |
| | Δ(cap) | | | | | | | | | |
| | Δ(liq) | | | | | | | | | |
| | Δ(log(liq)) | | | | | | | -0.45 | -2.26 | 0.03 |
| | Δ(log(liq(-1))) | 0.55 | 3.37 | 0.00 | | | | | | |
| | Δ(rl_fnh(-1)) | -1.67 | -2.62 | 0.01 | | | | | | |
| | Δ(rl_fnh(-2)) | -1.56 | -2.69 | 0.01 | | | | | | |
| | Δ(rl_cz_fnh) | | | | | | | 0.10 | 2.55 | 0.02 |
| | Δlog(log(p)) | | | | 0.74 | 1.52 | 0.14 | | | |
| | Δ(log(extlbtocap)) | | | | | | | | | |
| | Δ(log(loans(-1))) | | | | 0.31 | 2.10 | 0.04 | | | |
| | Δ(log(loans(-2))) | | | | | | | | | |
| | trend | 0.00 | 4.57 | 0.00 | | | | | | |
| | dummy | -0.13 | -7.52 | 0.00 | -0.04 | -3.81 | 0.00 | -0.03 | -3.39 | 0.00 |
| | Период | 2004Q4 - 2012Q4 | | | 2003Q3 - 2012Q4 | | | 2004Q2 - 2012Q4 | | |
| | Брой променливи | 33 | | | 38 | | | 35 | | |
| | R2 adj. | 0.75 | | | 0.69 | | | 0.51 | | |
| | F-Stat. | 16.85 | | | 21.30 | | | 9.97 | | |
| | DW stat. | 2.13 | | | 2.33 | | | 1.73 | | |
| | Тестове на остатъка | вероят. за прием. H0 | | | вероят. за прием. H0 | | | вероят. за прием. H0 | | |
| | Breusch-Godfrey Ser. Corr. LM test | 29% (4 лага) | | | 25% (9лага) | | | 63% (4 лага) | | |
| | ARCH Test | 60% (4 лага) | | | 96% (4 лага) | | | 29% (4 лага) | | |
| | Jarque-Bera Test | 91% | | | 88% | | | 70% | | |

(продължава)

(продължение)

| Коинтеграционно уравнение, включено в модела | | ECT (Полша) | | | ECT (Унгария) | | | ECT (Чехия) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Зависима променлива | log(loans) | | | log(loans) | | | log(loans) | | |
| | Регресори (независими пром.) | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. | Коеф. | t-стат. | p-val. |
| | constant | 8.66 | 39.45 | 0.00 | -25.3 | -4.38 | 0.00 | -3.30 | -10.9 | 0 |
| | log(netii) | | | | | | | | | |
| | cap | | | | | | | | | |
| | log(captoloans) | -0.60 | -2.53 | 0.02 | | | | -0.83 | -9.89 | 0.00 |
| | liq | | | | | | | | | |
| | log(liq) | -2.17 | -7.70 | 0.00 | -0.69 | -4.09 | 0.00 | -0.79 | -2.78 | 0.01 |
| | rl | -3.57 | -1.67 | 0.10 | | | | 0.06 | 1.72 | 0.10 |
| | pribor6m | | | | | | | -0.02 | -1.59 | 0.12 |
| | rd | | | | | | | | | |
| | log(extlbtocap) | | | | 0.77 | 9.09 | 0.00 | | | |
| | log(p) | | | | 7.59 | 6.02 | 0.00 | | | |
| | log(constr) | | | | | | | | | |
| | log(extdtoy) | | | | | | | | | |
| | trend | | | | -0.08 | -4.98 | 0.00 | 0.02 | 11.65 | 0.00 |
| | Период | 2004Q1 - 2012Q4 | | | 2003Q1 - 2012Q4 | | | 2004Q1 - 2012Q4 | | |
| | Брой променливи | 36 | | | 40 | | | 36 | | |

където: **constant** – константа; **trend** – времеви тренд; **ECT** – член за коригиране на грешката; Δ – първи разлики на променливата; **(-1), (-2), (-n)** – брой лагове, измерени в тримесечия; **dummy** – дъми променлива за структурното прекъсване, предизвикано от кризата, като за всяка страна СП е между първото и четвъртото тримесечие на 2008 г., измерено през промяната в реалния тримесечен БВП; **log(p)** – естествен (натурален) логаритъм от хармонизирания индекс на потребителските цени; **rl** – лихви по кредитите на нефинансовите фирми и домакинствата (дългосрочни и краткосрочни); **rd** – лихви по депозитите на нефинансовите фирми и домакинствата (дългосрочни и краткосрочни); **eurbr6m** – 6-месечен EURIBOR; **pribor6m** – 6-месечен междубанков лихвен процент в Чехия; **ctod** – съотношение между кредитите и депозитите на частния нефинансов сектор; **log(ctod)** – естествен логаритъм на съотношението кредити към депозити; **log(dep)** – естествен логаритъм на депозитите на частния нефинансов сектор (стойност с натрупване); **log(extdtoy)** – брутен външен дълг към БВП; **log(constr)** – естествен логаритъм на индекса на строителната продукция; **log(netii)** – естествен логаритъм на нетния лихвен доход; **cap** – съотношение между собствения капитал и банковите активи; **liq** – съотношение между ликвидните активи и банковите активи; **log(liq)** – естествен логаритъм от съотношението между ликвидните активи и банковите активи; **log(captoloans)** – естествен логаритъм от съотношението между собствения капитал и кредитите на частния нефинансов сектор; **log(extlbtoasts)** – естествен логаритъм от съотношението между банковите външни пасиви (задължения към нерезиденти) и банковите активи; **log(extlbtocap)** – естествен логаритъм от съотношението между банковите външни пасиви (задължения към нерезиденти) и банковия собствен капитал.

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## Списък на използваните съкращения

БВП – брутен вътрешен продукт
БДС – брутна добавена стойност
БНБ – Българска народна банка
ДДС – данък върху добавената стойност
ДЦК – държавни ценни книжа
ЕБВР – Европейска банка за възстановяване и развитие
ЕС – Европейски съюз
ЕЦБ – Европейска централна банка
ЗМР – задължителни минимални резерви
ИПС – Икономически и паричен съюз
ИПЦ – индекс на потребителските цени
МВФ – Международен валутен фонд
МНМК – метод на най-малките квадрати
СБ – Световна банка
СК – собствен капитал
СП – структурно прекъсване
ТБ – търговска банка
ФЛ – физически лица
ХИПЦ – хармонизиран индекс на потребителските цени
ЦБ – централна банка
ЦИЕ – Централна и Източна Европа
ARCH – Autoregressive conditional heteroskedasticity
DW – Durbin–Watson
EURIBOR – Euro Interbank Offered Rate
FSI – Financial Soundness Indicators
LM – Lagrange Multiplier
Q – тримесечие
VAR – Vector autoregression
BG – България
CZ – Чехия
DK – Дания
HU – Унгария
LT – Литва

LV – Латвия
PL – Полша
RO – Румъния
SE – Швеция
UK – Обединено кралство

DP/96/2014

# Фактори за динамиката на лихвените спредове на банките в България

Михаил Михайлов

Резюме. Спредът между лихвените проценти по кредитите и депозитите е важен източник на информация за развитието на банковия сектор. Целта на настоящото изследване е да идентифицира факторите за динамиката на лихвения спред в банковата система на България. Отговорът на този въпрос е потърсен посредством използването на панелен модел, в който е оценено влиянието на набор от основни макроикономически индикатори и индивидуални банкови характеристики. Според резултатите най-силно отражение върху лихвения спред в България има динамиката на оперативните разходи. Във връзка с това наблюдаваното през последните години свиване на разликата между лихвените равнища по кредитите и депозитите в голяма степен отразява постепенното подобряване на оперативната ефективност на банковата система. Поддържането на по-високи банкови резерви няма съществен ефект върху лихвения спред, а състоянието на капиталовата позиция и пазарният дял не оказват статистически значимо влияние върху неговата динамика.

Abstract. The spread between interest rates on loans and deposits is an important source of information on developments in the banking sector. The aim of the study is to identify the determinants of interest spread dynamics in the Bulgarian banking system. This issue is examined using a panel model which assesses the impact of a set of basic macroeconomic indicators and individual banks characteristics. The results suggest that the dynamics of operating costs are the most important determinant of changes in the bank interest rate spread in Bulgaria. In this regard, the decrease of the spread between the interest rates on loans and deposits that has been reported in the recent years reflects, to a large extent, the gradual improvement in the operational efficiency of the banking system. Maintaining higher level of bank reserves does not have economically significant effect on the bank interest spread, while the capital position and market share are not statistically significant.

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## Съдържание

## Въведение

Спредът между лихвените проценти по кредитите и депозитите е сред често наблюдаваните индикатори за състоянието на банковата система. Неговата динамика е важна за стабилността на банковия сектор, тъй като той до голяма степен определя размера на финансовия резултат на кредитните институции. Поддържането на по-широк лихвен спред осигурява по-висока печалба, която, ако бъде използвана за разширяване на капиталовата база, може да увеличи устойчивостта на банките към различните видове риск и по този начин да укрепи стабилността на банковата система.

Значението на лихвения спред като обект на изследване произтича и от това, че той може да служи като важен източник на информация за развитието на банковия сектор. Лихвеният спред отразява влиянието на редица фактори, сред които състоянието на оперативната ефективност и конкуренцията в банковата система, регулацията на задължителните минимални резерви, експозицията и чувствителността към кредитния риск, състоянието на капиталовата позиция, както и на макроикономическата среда. По този начин лихвеният спред може да бъде използван като косвен индикатор за ефективността на финансовото посредничество, силата на конкурентния натиск, влиянието на макроикономическите условия, регулативната рамка и различните рискове, на които е изложен банковият сектор.

Настоящото изследване има две задачи: първо, да представи обзор на теоретичната и приложната литература за формирането на лихвения спред на банките, както и на факторите, които оказват влияние върху неговия размер; и второ, да провери в каква степен използваните в литературата фактори обясняват динамиката на лихвения спред в банковата система на България. С оглед на факта, че някои индикатори отразяват едновременното действие на различни, а често и с противоположни по знак на ефекта фактори, важно е да се определи кое от въздействията доминира в оценката на съответните коефициенти в модела за лихвения спред. За да отговори на тези въпроси, изследването използва панелен модел, в който е оценено влиянието на набор от основни макроикономически индикатори и редица индивидуални банкови характеристики. Освен че осигурява по-голям брой наблюдения, използването на панелни данни дава основа и за по-задълбочен анализ, тъй като

отчита както динамиката на променливите във времето, така и хетерогенността сред отделните единици.

По-нататък във втория раздел от изложението е направен преглед на различните теоретични модели и подходи, използвани при емпиричните изследвания на лихвения спред. Раздел трети разглежда динамиката на лихвения спред в българската банкова система. След това са изброени факторите, с които ще се моделира лихвения спред в България, като са формулирани и хипотези за посоката на тяхното влияние. В раздел пети са описани източниците и статистическите характеристики на използваните данни, а в част шеста е представена спецификацията на построения модел. Последният раздел съдържа получените резултати. Накрая, в заключението са обобщени основните изводи от изследването.

## Преглед на литературата за лихвените спредове на банките

### *Теоретични модели за формирането на лихвения спред*

В литературата за лихвения спред съществуват два алтернативни теоретични подхода при анализа на неговото формиране. Единият от тях акцентира върху ролята на банката като финансов посредник, като в оригиналния си вид този подход е предложен от *Ho* и *Saunders* (1981), а впоследствие е доразвит от редица други автори. Алтернативният подход за теоретичен анализ на лихвения спред се базира върху използването на микроикономически модел на банката като предприятие.

*Ho* и *Saunders* (1981) предлагат теоретичен модел за формирането на лихвения спред, основно място в който се отделя на несигурността, съпътстваща ролята на банката като посредник между икономическите агенти, предлагащи депозити, и тези, които изпитват необходимост от заемни средства. В този модел банката е изправена пред несигурност, тъй като моментът на постъпване на ликвидни средства се различава от този, в който се получава искане за отпускане на кредит. В модела на *Ho* и *Saunders* (1981) лихвеният спред се разглежда като сума от таксите, които банката налага, за да неутрализира ефекта от несигурността по отношение на момента на осъществяване на трансакциите и от

липсата на синхрон между предлагането на депозити и търсенето на кредити.[1]

Теоретичната рамка, предложена от *Ho* и *Saunders* (1981), има значителни ограничения. Например, тя не взема предвид влиянието на кредитния риск и съществуването на оперативни разходи в процеса на финансово посредничество, като освен това допуска наличието на само един вид депозит и един вид кредит. По-късните публикации правят допълнения към оригиналния модел и преодоляват неговите слабости. *McShane* и *Sharpe* (1985) предлагат модел за банката като финансов посредник, в който лихвеният риск произтича от колебанията в лихвеното ниво на паричния пазар, а не от колебанията в лихвените проценти по депозитите и кредитите, както е в модела на *Ho* и *Saunders* (1981). *Allen* (1988) допуска наличието на два вида кредит с взаимно свързани функции на търсенето и показва, че лихвените спредове могат да се понижат, когато се вземат предвид кръстосаните еластичности на търсенето на банковите продукти. *Angbazo* (1997) отчита влиянието на кредитния и лихвения риск, както и на взаимодействието между тези два вида риск. *Maudos* и *Fernández* de *Guevara* (2004) включват оперативните разходи сред факторите, определящи лихвения спред. *Carbó* и *Rodríguez* (2007) разширяват модела на *Ho* и *Saunders* (1981), като отчитат влиянието на специализацията и „нетрадиционните" банкови дейности в теоретична рамка с няколко банкови продукта. Накрая, *Maudos* и *Solís* (2009) представят интегриран модел за лихвения спред, в който са обобщени всички допълнения към модела на *Ho* и *Saunders* (1981), т.е. отчетено е комбинираното влияние на кредитния и лихвения риск, оперативните разходи и „нетрадиционните" банкови дейности.

Другият основен подход за теоретичен анализ на лихвения спред се изразява в използването на микроикономически модел на банковото предприятие (*Zarruk*, 1989; *Zarruk* и *Madura*, 1992; *Wong*, 1997). *Zarruk* (1989) и *Zarruk* и *Madura* (1992) обясняват динамиката на лихвения спред с теоретични модели за банковото предприятие, в които съществува само един източник на несигурност – риск за устойчивостта на финансирането в *Zarruk* (1989) и кредитен риск в

[1] Основните идеи на модела и инструментариума за неговото извеждане са представени в приложението.

*Zarruk* и *Madura* (1992). В модела на *Zarruk* (1989) банката е изправена пред несигурност по отношение на обема на депозитите, които ще получи, докато функцията на търсенето на кредити е фиксирана. Този модел не взема предвид съществуването на други рискове в банковата дейност, което *Wong* (1997) посочва като обяснение, защо изводите в *Zarruk* (1989) се различават от теоретичните и емпиричните резултати на *Ho* и *Saunders* (1981). В модела на *Zarruk* и *Madura* (1992) също има само един риск, който е описан с вероятността кредитополучателите да не обслужат задълженията си.

*Wong* (1997) предлага по-богата теоретична рамка за банката като предприятие, което се стреми да максимизира полезността от печалбата при наличието на кредитен и лихвен риск. Независимо от алтернативния теоретичен подход, заключенията от неговия анализ относно влиянието на различните фактори върху размера на лихвения спред потвърждават изводите на *Ho* и *Saunders* (1981) и последвалите допълнения в модела на банката като финансов посредник. *Wong* (1997) показва, че оптималният лихвен спред е по-голям, когато банката се стреми да избягва риска, отколкото когато е неутрална към него, т.е. спредът при стремеж да се максимизира полезността от печалбата е по-висок от спреда, когато целта е да се максимизира самата печалба. С това е свързан и изводът, че лихвеният спред се разширява със засилването на стремежа на банката да избягва риска. Моделът на *Wong* (1997) извежда и положителната връзка на лихвения спред с възможността за упражняване на пазарно влияние, с оперативните разходи, кредитния риск и лихвения риск. Ефектът от повишението на лихвения процент на междубанковия пазар не е еднозначен и зависи от това, дали банката е нетен длъжник или нетен кредитор на междубанковия пазар. Увеличението на капитала води до свиване на спреда при отсъствие на лихвен риск, докато при наличие на лихвен риск ефектът не е еднозначен.

## *Подходи при анализа на лихвения спред в емпиричните изследвания*

Една от широко разпространените констатации в литературата за лихвения спред е, че неговият размер се характеризира със значителна вариация както във времето, така и сред отделните банки. Това е причината в моделите да присъстват не само променливи за макроикономическите условия,

регулаторната среда и състоянието на банковата система като цяло, но и голям брой индикатори, базиращи се на информация на ниво банка. На фона на тази обединяваща характеристика, публикациите в емпиричната литература за лихвения спред на банките се характеризират с голямо разнообразие от гледна точка на географския и времевия обхват на извадката, конкретната формулировка на зависимата променлива, възприетия подход в процеса на моделиране, както и от гледна точка на кръга на разглежданите обяснителни променливи.

Част от изследванията анализират факторите за динамиката на лихвения спред на базата на данни за банките в една държава. *Ho* и *Saunders* (1981) и *Angbazo* (1997) изследват лихвения спред в САЩ, съответно за периодите 1976–1979 *г.* и 1989–2003 *г.* *Afanasieff*, *Lhacer* и *Nakane* (2002) използват данни за Бразилия за периода 1997–2000 *г.*, *Liebeg* и *Schwaiger* (2006) за Австрия през 1996–2005 *г.*, *Horvath* (2009) – за Чехия през 2000–2006 *г.*, *Maudos* и *Solis* (2009) за Мексико през 1993–2005 *г.*, *Entrop*, *Memmel*, *Ruprecht* и *Wilkens* (2012) за Германия през 2000–2009 *г.*, *Männasoo* (2012) за Естония през 1999–2011 *г.* Сред публикациите, базирани на данни за банките в повече от една страна, са *Demirgüç-Kunt* и *Huizinga* (1999) за 80 страни в периода 1988–1995 *г.*, *Saunders* и *Schumacher* (2000) за САЩ и 6 страни от Европа през 1988–1995 *г.*, *Demirgüç-Kunt*, *Laeven* и *Levine* (2004) за 72 страни през 1995–1999 *г.*, *Maudos* и *Fernandez de Guevara* (2004) за 5 страни от Европа през 1993–2000 *г.*, *Peria* и *Mody* (2004) за 5 страни от Латинска Америка през 1995–2000 *г.*, *Schwaiger* и *Liebeg* (2007) за 11 страни от Централна и Източна Европа през периода 2000–2005 *г.*, *Valverde* и *Fernandez* (2007) за 7 страни от Европа през 1994–2001 *г.*, *Claeys* и *Vander Vennet* (2008) за 36 страни от Западна и Източна Европа през 1994–2001 *г.*, *Lepetit*, *Nys*, *Rous* и *Tarazi* (2008) за 12 страни от Европа през периода 1996–2002 *г.*

Друг критерий, по който могат да бъдат разделени приложните изследвания в тази област, е конкретната дефиниция на зависимата променлива. Обект на анализа в *Afanasieff*, *Lhacer* и *Nakane* (2002) и *Peria* и *Mody* (2004) е спредът между лихвените проценти по кредитите и депозитите. Част от изследванията разглеждат съотношението на нетния лихвен доход към доходоносните активи (*Ho* и *Saunders*, 1981; *Angbazo*, 1997; *Saunders* и *Schumacher*, 2000; *Demirgüç-Kunt*, *Laeven* и *Levine*, 2004; *Claeys* и *Vander Vennet*, 2008) или съотношението на нетния лихвен доход към общата сума на активите (*Demirgüç-Kunt* и *Huizinga*, 1999; *Maudos* и *Fernandez de*

*Guevara*, 2004; *Liebeg* и *Schwaiger*, 2006, 2007; *Horvath*, 2009; *Maudos* и *Solis*, 2009). *Valverde* и *Fernandez* (2007) анализират спреда между имплицитните лихвени проценти по кредитите и депозитите, спреда между лихвения процент по кредитите и лихвеното ниво на паричния пазар, както и съотношението на брутния доход към общата сума на активите. *Lepetit*, *Nys*, *Rous* и *Tarazi* (2008) моделират разликата между съотношението нетен лихвен доход/доходоносни активи и пазарния лихвен процент, разликата между имплицитния лихвен процент по кредитите и пазарния лихвен процент, съотношението нетен лихвен доход/доходоносни активи, както и разликата между имплицитните лихвени проценти по кредитите и пасивите. *Entrop*, *Memmel*, *Ruprecht* и *Wilkens* (2012) разглеждат съотношението на нетния лихвен доход към общата сума на активите, като наред с това моделират съотношенията лихвени приходи/доходоносни активи и лихвени разходи/пасиви с изплащане на лихви. *Männasoo* (2012) анализира спреда между лихвените проценти по кредитите и депозитите, както и спреда между лихвения процент по кредитите и ЮРИБОР.

В емпиричните изследвания на лихвения спред на банките съществуват два подхода по отношение на процеса на моделиране. *Ho* и *Saunders* (1981) предлагат двустъпков модел за анализ на лихвения спред. В първия етап те оценяват *cross section* модел за всяко едно тримесечие в рамките на разглеждания от тях период, като регресират лихвения спред с индивидуални банкови характеристики, различни от факторите, посочени в техния теоретичен модел (имплицитни лихви по депозитите, алтернативна цена на поддържаните задължителни минимални резерви и експозиция към кредитен риск). Константите в този модел образуват серия, която *Ho* и *Saunders* (1981) разглеждат като „чист" лихвен спред, т.е. спредът, обект на теоретичния модел. Във втория етап „чистият" лихвен спред се регресира на променливата за колебанията в лихвеното ниво на паричния пазар, като константата в това уравнение се разглежда като показател за степента на конкуренция на пазара, а коефициентът пред индикатора за колебанията на пазарния процент – като измерител на другите фактори, присъстващи в теоретичния модел. *Saunders* и *Schumacher* (2000), *Afanasieff*, *Lhacer* и *Nakane* (2002) и *Männasoo* (2012) също използват двустъпковия метод за анализ на лихвения спред, като обаче се отклоняват от *Ho* и *Saunders* (1981) в някои отношения, например с използването на панелен вместо *cross sec-*

*tion* модел и с включването на допълнителни индивидуални банкови характеристики в първата фаза на процеса на моделиране.

Много по-широко разпространен в литературата е алтернативният подход, при който моделирането на лихвения спред се осъществява в рамките на едно уравнение, съдържащо разнообразни по характер фактори: индивидуални банкови характеристики, индикатори за степента на конкуренция, макроикономически променливи, както и особености на регулаторния режим. В групата на индивидуалните банкови характеристики попадат размерът на банката (измерен със сумата на активите или големината на пазарния дял), съотношението на оперативните разходи към активите, капиталовата позиция (апроксимирана със съотношението на капитала към активите), както и експозицията към различните видове риск, присъщи на банковата дейност. Например, кредитният риск се измерва с дела на необслужваните кредити в общите кредитни експозиции, съотношението на нетните отписвания на кредити към общата сума на кредитите или на начислените провизии към размера на кредитните експозиции, а буферите срещу ликвиден риск обикновено се апроксимират с отношението на ликвидните активи към обема на привлечените средства. В качеството на променлива за степента на конкуренция се използват показатели за концентрация в банковия сектор: индекс на Херфиндал – Хиршман, сума от пазарните дялове на най-големите банки или индекс на Лернер (разликата между цената – в случая лихвения процент по кредитите, и пределните разходи, изразена като дял от цената). Групата на макроикономическите променливи обикновено е представена от икономическия растеж и темпа на инфлация, а съотношението на неносещите лихвени приходи активи към общия обем на активите е променлива, която отчита влиянието на регулацията на минималните задължителни резерви.

Въз основа на прегледа на литературата за лихвените спредове на банките може да се направи изводът, че преобладаващата част от емпиричните модели съчетават идеи на разнообразни теоретични постановки. Най-общо динамиката на лихвения спред се разглежда като функция на разходите за дейността, рисковете в банковата дейност, пазарната структура, особеностите на регулаторния режим и макроикономическата среда.

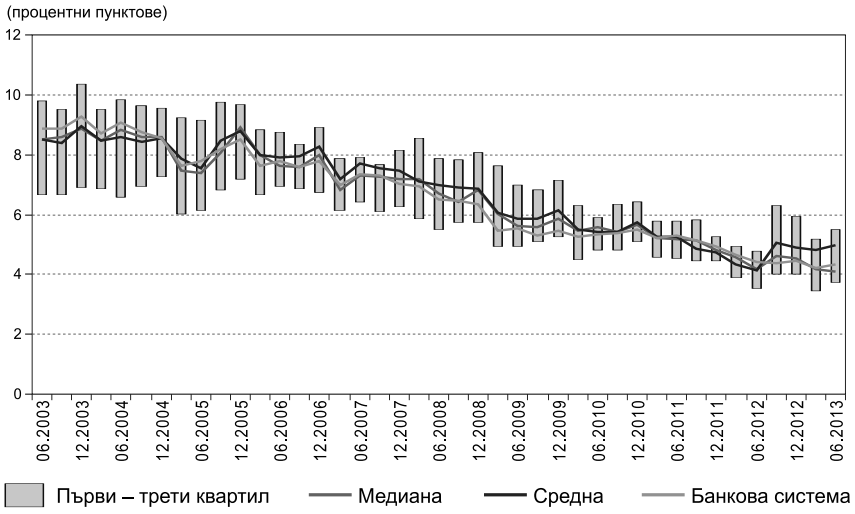
## Дефиниция и динамика на лихвения спред в България

Разнообразието от показатели за лихвения спред налага още в началото да се направят уточнения по отношение на неговата дефиниция в това изследване. Първо, необходимо е уточнение за кръга активи и пасиви, които ще бъдат обхванати при определянето на лихвения спред. В най-широк смисъл лихвеният спред може да се определи като разлика между лихвените равнища по всички лихвоносни активи и цената на всички ресурси, за привличането на които се правят лихвени разходи. Това изследване се ограничава с една по-тясна дефиниция, която обхваща само основната част от банковата дейност, а именно привличането на депозити и отпускането на кредити на нефинансовите институции и домакинствата, т.е. тук лихвеният спред измерва разликата между цената на отпуснатите от банките кредитни ресурси и лихвения процент по привлечените депозити. Второ, в това изследване лихвените равнища по кредитите и депозитите представляват имплицитни лихвени проценти, т.е. те са изчислени индиректно въз основа на данни от финансовите отчети на банките, като лихвените приходи по кредитите и направените разходи по депозитите са разделени на обема на кредитите, съответно на депозитите. Причината да се използват имплицитни лихвени проценти по кредитите и депозитите е, че лихвената статистика на БНБ не предоставя публична информация за лихвените равнища, прилагани от отделните банки. Използването на имплицитни лихвени проценти има своите предимства и ограничения в сравнение с информацията за лихвените проценти по новоотпуснатите кредити и новооткритите депозити. От една страна, имплицитните лихвени проценти са по-удобни от гледна точка на анализа на рентабилността, тъй като са по-тясно свързани с финансовия резултат в сравнение с данните за лихвените проценти по нов бизнес. От друга страна обаче, за тях са присъщи ограниченията, характерни за статистиката за лихвените проценти по салда. Подобно на тях имплицитните лихвени проценти отразяват в голяма степен и минали решения, което затруднява проследяването на реакцията на лихвената политика към изменения на определящите я фактори. Освен това имплицитните лихвени проценти по заемните ресурси не се отнасят за целия обем на кредитите, а само за тези от тях, по които се начисляват лихвени приходи, т.е. извън обхват остават необслужваните експозиции.

Графика 1 изобразява динамиката на лихвения спред, а графики 2 и 3 – съответно имплицитните лихвени проценти по кредитите и по депозитите. Наред със стойността на съответните индикатори за банковата система (без клоновете на чуждестранни банки), на графиките е представена и информация, описваща хетерогенността сред отделните кредитни институции (средна, медиана и разлика между трети и първи квартил). Графиките показват наличието на съществени различия в стойностите на показателите сред разглежданите банки, което потвърждава необходимостта от оценяването на модел с панелни данни. По отношение на динамиката на лихвения спред прави впечатление, че той следва низходяща тенденция през целия период, като до края на 2008 г. неговото свиване е свързано с покачването на лихвения процент по депозитите, а след това – с понижаването на имплицитния лихвен процент по кредитите.

Графика 1

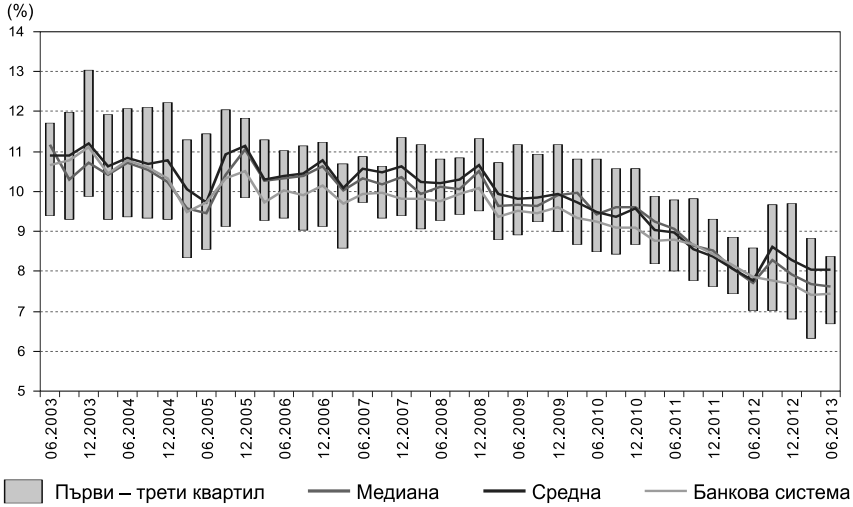
**СПРЕД МЕЖДУ ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ И ДЕПОЗИТИТЕ**




**Източници:** БНБ, собствени изчисления.

Графика 2

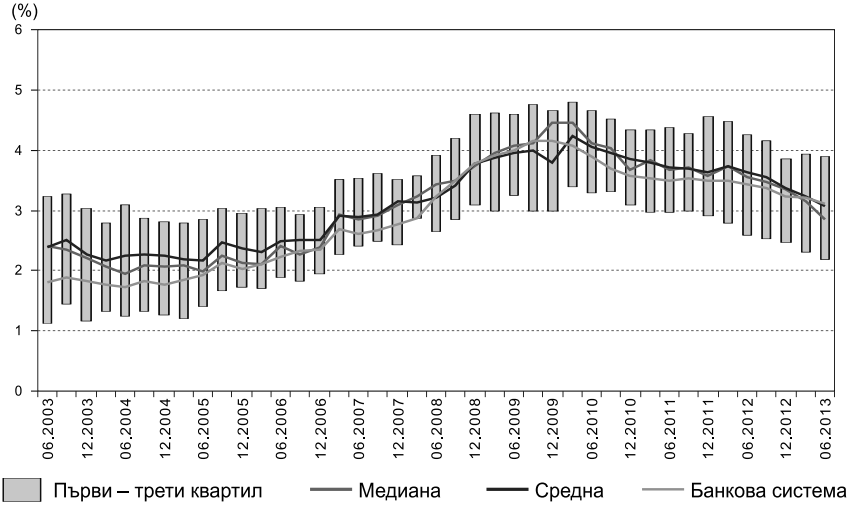
**ИМПЛИЦИТЕН ЛИХВЕН ПРОЦЕНТ ПО КРЕДИТИТЕ**




**Източници:** БНБ, собствени изчисления.

Графика 3

**ИМПЛИЦИТЕН ЛИХВЕН ПРОЦЕНТ ПО ДЕПОЗИТИТЕ**




**Източници:** БНБ, собствени изчисления.

## Обяснителни променливи в модела за лихвения спред

Както беше посочено в прегледа на научната литература по темата, обичайната практика при емпиричния анализ на лихвения спред е съчетаването на идеи на разнообразни теоретични постановки. Най-общо, динамиката на лихвения спред се разглежда като отражение на разходите за дейността, рисковете в банковата дейност, пазарната структура, особеностите на регулаторния режим и макроикономическата среда. Следвайки този подход, в настоящото изследване лихвеният спред е разгледан като функция на набор от макро- и микроикономически променливи, за които се предполага, че влияят върху ценовата политика на банките. Тук са изброени факторите, с които ще се моделира лихвеният спред, като са формулирани и хипотези за посоката на тяхното влияние.

Една част от обяснителните променливи в модела отчитат влиянието на макроикономическата среда. Първо, върху размера на лихвения спред би трябвало да дават отражение инфлационните очаквания, тъй като изгледите за ускоряване на инфлацията засилват несигурността, на което се очаква банките да реагират с разширяване на лихвения спред. Този ефект би трябвало да се проявява особено ясно в условията на висок и силно колеблив темп на инфлация, докато в среда на слабо изменение на цените отражението на инфлационните очаквания се очаква да бъде ограничено или да липсва. Второ, величината на лихвения спред би трябвало да се променя в съответствие със състоянието на икономическата активност. Чрез влиянието си върху финансовото състояние на кредитополучателите тенденциите в икономическата активност се отразяват върху кредитния риск в икономиката и съответно върху изискваната от банките рискова премия. Високата икономическа активност влияе положително върху финансовото състояние на кредитополучателите и понижава общия риск в икономиката, което създава условия за намаление на рисковата премия и лихвения спред. Обратно, отслабването на икономическата активност поражда опасения за способността на длъжниците да обслужват своите дългове и води до увеличение на изискваната от банките рискова премия. При използване на данни за лихвения спред, базирани на имплицитни лихвени проценти, съществува обаче вероятност връзката между състоянието на икономическата активност и лихвения спред да се окаже положителна. Например, в условията на благоприятна

стопанска конюнктура способността на кредитополучателите да обслужват задълженията си е по-голяма, което се отразява в по-висок размер на събраните от банките лихвени приходи и съответно на изчислените на тяхна база имплицитен лихвен процент по кредитите и лихвен спред. При спад на икономическата активност имплицитният лихвен процент по кредитите и лихвеният спред също може да се понижат поради по-слабата способност на кредитополучателите да обслужват редовно задълженията си и съответно по-малкия размер на начислените лихвени приходи.

Сред факторите, влияещи върху лихвения спред, централно място е отделено на променливите, които отразяват индивидуалните характеристики на банките. Един от основните фактори, попадащи в тази категория, са оперативните разходи за дейността. Тяхното равнище се измерва със съотношението на нелихвените разходи към сумата на активите. Тъй като се очаква, че банките биха прехвърлили всяко увеличение на оперативните разходи (понижение на оперативната ефективност) върху вложителите и кредитополучателите чрез разширяване на лихвените спредове, по-високите оперативни разходи би трябвало да са свързани с по-широк лихвен спред.

Състоянието на икономическата активност може да осигури представа за общия кредитен риск в икономиката, от значение обаче е и индивидуалната експозиция на банките към кредитен риск. За тази цел равнището на кредитния риск обикновено се свързва с текущото качество на вземанията, измерено като дял на необслужваните кредити или съотношение на начислените обезценки към общия обем на кредитите. Необходимо е да се посочи, че някои обстоятелства ограничават способността на индикаторите за качеството на кредитния портфейл да отразяват реалната експозиция към кредитен риск. Измерен с качеството на вземанията, кредитният риск обикновено се подценява по време на икономически бум и надценява по време на рецесия. Освен това индикаторите за качеството на кредитите губят от съдържанието си и в периоди на кредитна експанзия, тъй като качеството на кредитния портфейл се проявява с известно забавяне. Специфичен недостатък на съотношението обезценки/кредитен портфейл е, че то може да се влияе както от качеството на вземанията, така и от следваната от банките политика за начисляване на провизии. Въпреки тези ограничения,

съображенията за достъпност на данните са причината експозицията към кредитен риск обикновено да се измерва именно посредством индикатори за качеството на вземанията. За целите на изследването индивидуалната изложеност на кредитен риск е измерена със съотношението на начислените обезценки към общия размер на кредитите за нефинансови институции и домакинства, като се приема, че евентуално повишение на отношението на обезценките към размера на кредитния портфейл може да изостри чувствителността към кредитен риск и изискваната за него рискова премия, а оттам да доведе и до разширяване на лихвения спред. Спецификата на използвания в това изследване показател за лихвения спред, изразяваща се в изчисляването му на база имплицитни лихвени проценти, е обаче причина да не се изключва вероятността за влияние и в обратната посока. Например, по-високо отношение на обезценките към обема на кредитите може да означава влошено качество на вземанията, по-малък размер на начислените приходи от лихви и съответно по-ниски стойности на имплицитния лихвен процент по кредитите и лихвения спред.

Отношението на собствения капитал към обема на активите също може да влияе върху размера на лихвения спред. Очакванията за връзка между двете променливи обикновено се базират на допускането, че добре капитализираните банки се ползват с по-високо доверие от страна на вложителите, което им позволява да привлекат депозити и при по-ниски лихвени проценти. Това води до по-ниска средна цена на финансирането и оттам до по-широк лихвен спред. Наличието на негативна връзка между капиталовата позиция и лихвения спред обаче също не трябва да се изключва напълно. Широкото използване на собствен капитал при финансирането на дейността може да се интерпретира и като индикатор за ограничени възможности при привличането на външни ресурси. За да разширят депозитната си маса, банките в такава ситуация са склонни да предлагат по-високи лихвени проценти по депозитите, което се отразява в стесняване на лихвения спред.

Влияние върху размера на лихвения спред се очаква и от поддържането на активи, които не носят доход или осигуряват доходност, по-ниска от пазарната. Поддържането на такива активи е свързано с пропусната доходност, загубата на която банките обикновено компенсират с увеличение на лихвения спред. За да се оцени влиянието на този фактор, сред обяснителните променливи в модела е включено съотношението на безлихвените

активи (сумата от касовите наличности и средствата по разплащателни сметки в БНБ) към депозитите на нефинансовите институции и домакинствата. В литературата за лихвените спредове съотношението на банковите резерви към депозитите обикновено се свързва изцяло с регулаторни изисквания, по-конкретно с политиката на централната банка по отношение на задължителните минимални резерви. Тъй като обаче поддържането на банкови резерви се определя и от трансакционни мотиви, необходимо е да се има предвид, че върху обема на резервите би могла да повлияе и евентуална промяна в начина, по който банките управляват своята ликвидност. Понеже тези влияния трудно могат да бъдат изолирани, това изследване разглежда какви са ефектите от поддържането на безлихвени активи като цяло, независимо дали то е обусловено от регулаторни изисквания, или от други съображения.

Интересно е да се провери и дали начинът, по който са разпределени пазарните дялове, влияе върху размера на лихвения спред. Хипотезата за наличие на такава връзка се основава на допускането, че разпределението на пазарните дялове отразява конкурентните условия на пазара. Колкото по-висока е концентрацията на пазара, толкова по-вероятно е да се наблюдава неконкурентно поведение, водещо до по-висок размер на лихвения спред. Отделно от това може да се очаква, че големите банки поддържат по-високи спредове заради пазарното влияние, с което разполагат. Допускането е, че големият пазарен дял на даден участник му осигурява възможност да наложи по-ниска цена за привлечените ресурси и по-високи лихвени проценти по кредитите. За да се провери този ефект, сред индивидуалните характеристики на банките е включен пазарният дял, изчислен на база обема на активите.

## Източници на данни

За целите на изследването са използвани данни за периода от началото на 2003 г. до средата на 2013 г. Сериите се с тримесечна честота.

Източник на данните, отразяващи състоянието на макроикономическата среда, е Националния статистически институт (НСИ). Състоянието на икономическата активност е апроксимирано със съставния индикатор за бизнес климата в икономиката. Влиянието на инфлационните очаквания е обхванато

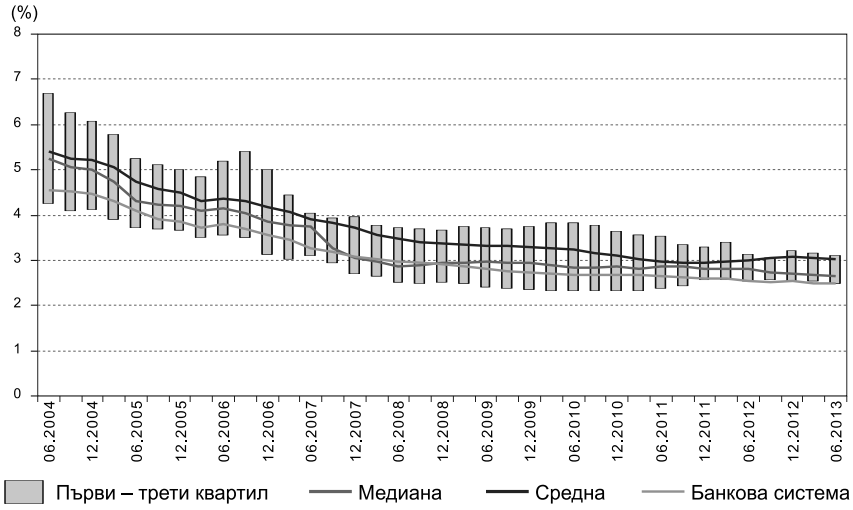
с включването на годишния темп на нарастване на хармонизирания индекс на потребителските цени, като допускането е, че фактическите стойности на инфлацията служат за основа при формирането на инфлационните очаквания.

Основната част от разглежданите променливи представляват индивидуални характеристики на кредитните институции, като източникът на информация за тях са финансовите отчети, които банките предоставят на БНБ за надзорни цели. Данните от тези отчети са използвани за изчисляване на лихвените спредове и на индикаторите за отделните банки, които присъстват в модела като обяснителни променливи. За целите на анализа са използвани данни за всички функционирали през разглеждания период банки в България, с изключение на клоновете на чуждестранни кредитни институции. Причината те да бъдат изключени от обхвата на извадката е, че голяма част от привлечените от тях средства е формирана не от депозити на местни лица, а от финансиране от централите им в чужбина. В случаите на преструктуриране на пазара под формата на сливане или поглъщане банката, получена в резултат на поглъщането/сливането, се третира като нова кредитна институция. Панелът от данни е небалансиран, тъй като обхванатите от него банки се различават по дължината на периода, през който са оперирали на пазара.

Индикаторите за индивидуалните характеристики на кредитните институции са изчислени по начина, описан в предходния раздел на изследването. Уточнение е необходимо само по отношение на показателя за оперативните разходи – за да се неутрализира силно изразената сезонност в неговата динамика, той е изчислен, като движещата се сума на оперативните разходи през последните четири тримесечия е разделена на средната стойност на активите през същия период. Тази трансформация е причината извадката, въз основа на която ще бъде оценен моделът за лихвения спред, да започва от началото на 2004 г.

Графика 4

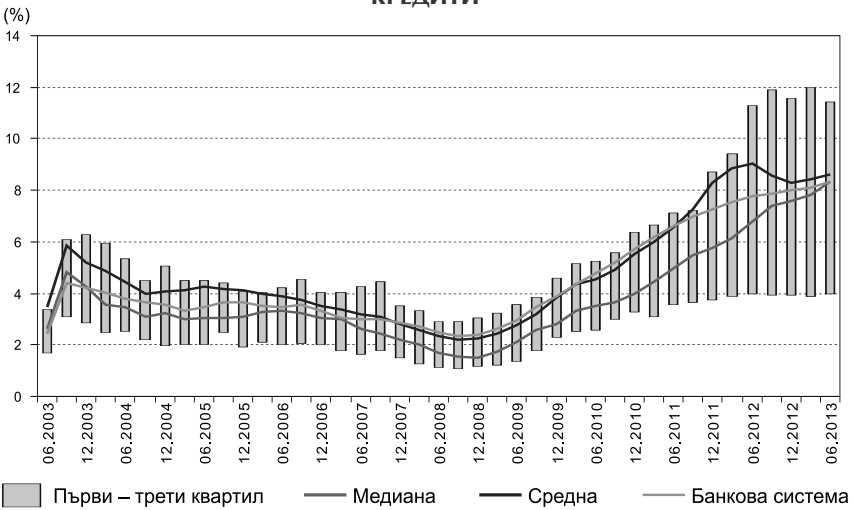
**СЪОТНОШЕНИЕ НА ОПЕРАТИВНИТЕ РАЗХОДИ КЪМ АКТИВИТЕ (ДВИЖЕЩА СЕ СРЕДНА ЗА ПОСЛЕДНИТЕ ЧЕТИРИ ТРИМЕСЕЧИЯ)**




**Източници:** БНБ, собствени изчисления.

Графика 5

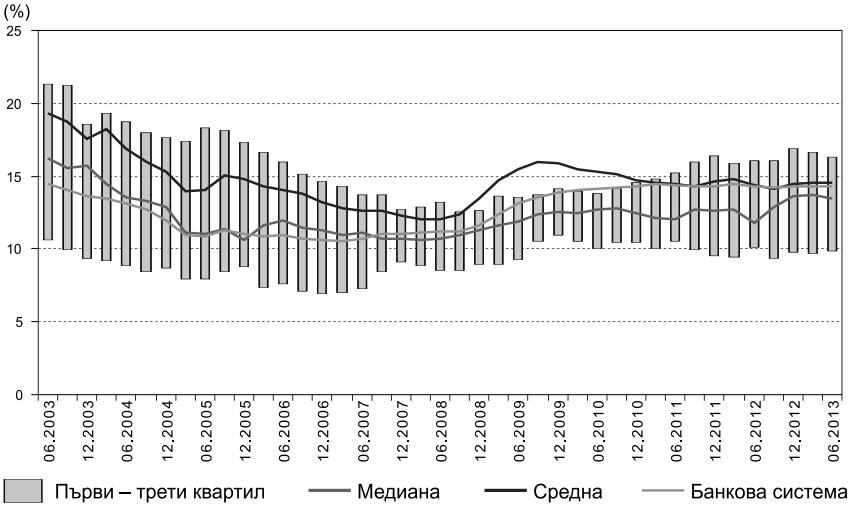
**СЪОТНОШЕНИЕ НА НАЧИСЛЕНИТЕ ОБЕЗЦЕНКИ КЪМ БРУТНИТЕ КРЕДИТИ**




**Източници:** БНБ, собствени изчисления.

Графика 6

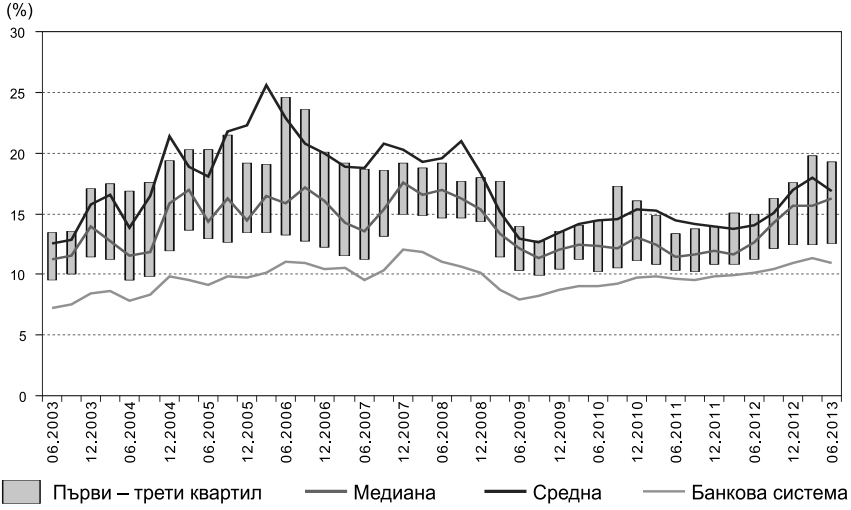
**СЪОТНОШЕНИЕ НА СОБСТВЕНИЯ КАПИТАЛ КЪМ АКТИВИТЕ**




**Източници:** БНБ, собствени изчисления.

Графика 7

**СЪОТНОШЕНИЕ НА БАНКОВИТЕ РЕЗЕРВИ КЪМ ДЕПОЗИТИТЕ**




**Източници:** БНБ, собствени изчисления.

На графики 4–7 е представена динамиката на индикаторите за оперативните разходи, индивидуалната изложеност към кредитен риск, капиталовата позиция и съотношението на банковите резерви към активите. Наред със стойностите на съответните индикатори за банковата система (без клоновете на чуждестранни банки) е представена и информация, описваща хетерогенността сред отделните кредитни институции (средна, медиана и разлика между трети и първи квартил). Графиките показват наличието на силна вариация в стойностите на показателите сред разглежданите банки, което потвърждава необходимостта от използването на модел с панелни данни.

Преди да се пристъпи към иконометричното моделиране е необходимо да се провери степента на интегрираност на разглежданите променливи. Спрямо индикаторите за индивидуалните банкови характеристики бяха използвани няколко теста за единичен корен, резултатите от които са обобщени в таблица 1.

Таблица 1

**ТЕСТОВЕ ЗА ЕДИНИЧЕН КОРЕН НА ИНДИВИДУАЛНИТЕ БАНКОВИ ХАРАКТЕРИСТИКИ**

| Нива | | | | | | |
|---|---|---|---|---|---|---|
| Method | SPREAD | OPER | ILR | CAP | RES | MS |
| Null: Unit root (assumes common unit root process) | | | | | | |
| Levin, Lin & Chu t | -4.0*** | -8.2*** | 1.0 | -5.3*** | -3.7*** | 0.3 |
| Null: Unit root (assumes individual unit root process) | | | | | | |
| Im, Pesaran and Shin W-stat | -3.1*** | -4.9*** | -0.8 | -2.6*** | -4.1*** | 1.3 |
| ADF - Fisher Chi-square | 118.5*** | 156.4*** | 110.4*** | 119.5*** | 122.7*** | 49.4 |
| PP - Fisher Chi-square | 154.8*** | 152.3*** | 58.8 | 121.1*** | 102.3*** | 68.1 |
| Първи разлики | | | | | | |
| Method | SPREAD | OPER | ILR | CAP | RES | MS |
| Null: Unit root (assumes common unit root process) | | | | | | |
| Levin, Lin & Chu t | -32.3*** | -5.1*** | -7.0*** | -14.0*** | -17.2*** | -10.3*** |
| Null: Unit root (assumes individual unit root process) | | | | | | |
| Im, Pesaran and Shin W-stat | -32.0*** | -8.0*** | -14.6*** | -13.3*** | -17.2*** | -9.7*** |
| ADF - Fisher Chi-square | 780.1*** | 192.7*** | 335.9*** | 339.4*** | 433.5*** | 245.8*** |
| PP - Fisher Chi-square | 955.1*** | 236.1*** | 474.5*** | 298.8*** | 502.8*** | 220.6*** |

**Бележка:** В таблицата са представени стойностите на статистиките за различните тестове. Нулевата хипотеза е за наличие на единичен корен. Знаците ***,**,* означават отхвърляне на нулевата хипотеза при ниво на значимост съответно 1%, 5% и 10%.

Тестовете за единичен корен бяха приложени по отношение на нивата и първите разлики на променливите. Според резултатите нулевата хипотеза за единичен корен в нивата се отхвърля категорично при спреда между имплицитните лихвени проценти по кредитите и депозитите (*SPREAD*), отношението на оперативните разходи към активите (*OPER*), отношението на собствения капитал към активите (*CAP*) и отношението на банковите резерви към обема на депозитите (*RES*). Това означава, че тези променливи могат да участват в модела със своите равнища. Обратно, нулевата хипотеза за единичен корен не може да се отхвърли при нивата на индикатора за пазарния дял (*MS*) и при три от четирите теста за интегрираност на отношението на обезценките към брутния размер на кредитите (*ILR*). Първите разлики на тези променливи обаче са стационарни, което означава, че трансформирани по този начин, те могат да бъдат използвани за целите на иконометричния анализ.

## Спецификация на модела за лихвения спред

Въз основа на изложеното дотук моделът може да бъде представен формално в следния вид:

$$SPREAD_{it} = \alpha_i + \beta_1 BC_t + \beta_2 \Delta INFL_t + \beta_3 OPER_{it} + \beta_4 \Delta ILR_{it} + \beta_5 CAP_{it} + \beta_6 RES_{it} + \beta_7 \Delta MS_{it},$$

където:

***SPREAD*** е разликата между имплицитните лихвени проценти по кредитите и по депозитите,

***BC*** е индикаторът за бизнес климата в икономиката,

Δ***INFL*** е ускорението на темпа на годишно нарастване на хармонизирания индекс на потребителските цени,

***OPER*** е отношението на оперативните разходи към обема на активите,

Δ***ILR*** е изменението в отношението на начислените обезценки по кредити към брутната стойност на кредитите за предприятия и домакинства,

***CAP*** е отношението на собствения капитал към сумата на активите,

***RES*** е отношението на паричните средства в каса и по сметки в БНБ към депозитите от нефинансови институции и домакинства,

$\Delta MS$ е изменението на пазарния дял на банката, изчислен на база обем на активите,

$\alpha_i$ е индивидуален ефект.

Индексите ***i*** и ***t*** показват, че стойностите на променливите се отнасят за банка ***i*** в период ***t***.

Панелният модел е оценен с индивидуални ефекти $\alpha_i$, отразяващи различията сред банките. Това е направено чрез включването на индивидуален независим член за всяка от банките (*fixed effects model*). Този вариант беше предпочетен пред алтернативата индивидуалните ефекти да се представят като компоненти на грешката (*random effects model*), тъй като разглежданите единици са точно определени, а не случайно изтеглени от голямо множество.

## Резултати

В таблица 2 са представени резултатите от иконометричната оценка на панелния модел за лихвения спред. Влиянието на макроикономическите променливи в голяма степен се разминава с изводите в изследванията от емпиричната литература, но това вероятно е свързано с особеностите на разглеждания период и на използваните данни. Първо, коефициентът пред ускоряването на годишния темп на нарастване на хармонизирания индекс на потребителските цени е статистически и икономически незначим, причината за което вероятно е фактът, че инфлационните очаквания в България са били сравнително умерени през голяма част от разглеждания период и особено след започналото през 2009 г. отражение на глобалната криза върху икономиката на страната. Това съответства на хипотезата, че влиянието на инфлацията върху ценовата политика може да се характеризира с нелинейност, т.е. да е ясно изразено в условията на висок и колеблив темп на инфлация, докато в среда на ниска инфлация очакванията за изменение на цените може да се отразяват много слабо или изобщо да не влияят върху ценовата политика на банките и съответно върху лихвения спред.

Коефициентът пред индикатора за бизнес климата е статистически значим и има положителен знак. Последното може да се дължи на комбинацията от епизод на понижена икономическа активност в рамките на разглеждания период и използването на измерител на лихвения спред, базиран на имплицитни лихвени проценти. В този случай имплицитният лихвен процент по кредитите и лихвеният спред се понижават поради по-слабата

способност на кредитополучателите да обслужват редовно задълженията си и съответно по-малкия размер на начислените лихвени приходи, като това влияние преобладава над ефекта от обратната зависимост между нивото на икономическата активност и изискваната от банките премия за риска в икономиката.

Таблица 2

**РЕЗУЛТАТИ ОТ ОЦЕНКАТА НА ПАНЕЛНИЯ МОДЕЛ ЗА ЛИХВЕНИЯ СПРЕД**

Dependent Variable: SPREAD
Fixed effects model (fixed effects not reported)
Sample (adjusted): 2004Q1 – 2013Q2
Included observations: 38 after adjustments
Cross-sections included: 32
Total pool (unbalanced) observations: 943
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)

| Variable | Coefficient | t-Statistic | Prob. |
|---|---|---|---|
| OPER | 0.6566 | 8.1 | 0.0000 |
| CAP | -0.0246 | -1.6 | 0.1033 |
| RES | 0.0205 | 3.4 | 0.0006 |
| Δ ILR | -0.1726 | -2.1 | 0.0343 |
| Δ MS | -0.2932 | -1.4 | 0.1729 |
| BC | 0.0510 | 4.9 | 0.0000 |
| Δ INFL | 0.0155 | 0.3 | 0.8017 |
| Adjusted R-squared | 0.51 | | |
| F-statistic | 27.0 | | |
| Prob(F-statistic) | 0.0000 | | |

Сред всички разглеждани променливи най-силно отражение върху лихвения спред дава отношението на оперативните разходи към активите на банките. Според резултатите понижение на отношението на оперативните разходи към активите с един процентен пункт води до свиване на лихвения спред с 0.65 процентни пункта. Положителната връзка между двете променливи отговаря на хипотезата, че измененията на равнището на оперативната ефективност се пренасят върху размера на лихвения спред. Във връзка с това постепенното подобрение

на оперативната ефективност на банковата система през последните години може да се разглежда като една от основните причини за свиването на разликата между лихвените равнища по кредитите и депозитите.

Резултатите не потвърждават достатъчно категорично хипотезата, че поддържането на по-високи банкови резерви е свързано с увеличение на лихвения спред. Въпреки че е налице положителна зависимост между лихвения спред и съотношението на банковите резерви към депозитите, според получените резултати този ефект не е икономически значим (повишение с един процентен пункт предизвиква разширяване на лихвения спред само с 2 базисни точки).

Съотношението на обезценките към брутния размер на кредитите е статистически значим фактор за динамиката на лихвения спред, като знакът на коефициента пред неговото изменение е негативен. Подобно на случая с индикатора за бизнес климата, и тук това показва, че ефектът на качеството на кредитите върху използвания измерител на лихвения спред е свързан по-силно с влиянието върху обема на начислените лихвени приходи по кредитите, отколкото със стремежа на банките да изискват по-висока премия за кредитен риск при влошаване на качеството на вземанията.

Според резултатите състоянието на капиталовата позиция не оказва статистически значимо влияние върху динамиката на лихвения спред, което може да се дължи на взаимното неутрализиране на двата очаквани ефекта на този фактор. При някои банки високото отношение на капитала към активите може да им позволява да привлекат депозити и при по-ниски лихвени проценти, което води до по-ниска средна цена на финансирането и оттам до по-голям лихвен спред. В други случаи обаче широкото използване на собствен капитал при финансирането на дейността може да се интерпретира като индикатор за ограничени възможности при привличането на външни ресурси и съответно да бъде причина за предлагането на по-високи лихвени проценти по депозитите, което се отразява в стесняване на лихвения спред.

Подобно на голяма част от емпиричната литература, резултатите отхвърлят хипотезата за наличие на връзка между лихвения спред и пазарния дял на банките. Отсъствието на такава зависимост може да се дължи на факта, че пазарният дял не отразява влиянието, упражнявано от съответната банка на

пазара. Това е много вероятно, като се има предвид, че хипотезата за връзката между пазарните дялове и конкурентните условия не се ползва с всеобща подкрепа в научната литература. Друго възможно обяснение е, че конкуренцията сред банките намира израз главно при неценовите условия, а не по отношение на лихвените проценти и съответно лихвения спред.

## Заключение

В изследването е анализиран спредът между лихвените проценти по кредитите и депозитите на банките в България. Неговата динамика е важна за стабилността на банковия сектор, тъй като той до голяма степен определя размера на финансовия резултат на кредитните институции. Поддържането на по-широк лихвен спред осигурява по-висока печалба, която, ако бъде използвана за разширяване на капиталовата база, може да увеличи устойчивостта на банките към различните видове риск и по този начин да укрепи стабилността на банковата система. Значението на лихвения спред като обект на изследване произтича и от това, че той може да служи като важен източник на информация за развитието на банковия сектор. Задачата на изследването е да провери в каква степен разглежданите в литературата фактори обясняват динамиката на лихвения спред на банковата система в България, като отговорът на този въпрос е потърсен посредством използването на панелен модел, в който е оценено влиянието на набор от основни макроикономически индикатори и редица индивидуални банкови характеристики.

Сред всички разглеждани променливи най-силно отражение върху лихвения спред дава съотношението на оперативните разходи към активите на банките. Според резултатите понижение на отношението на оперативните разходи към активите с един процентен пункт води до свиване на лихвения спред с 0.65 процентни пункта. Във връзка с това, постепенното подобрение на оперативната ефективност на банковата система през последните години може да се разглежда като една от основните причини за свиването на разликата между лихвените равнища по кредитите и депозитите. Същевременно резултатите не потвърждават достатъчно категорично хипотезата, че поддържането на по-високи банкови резерви е свързано с увеличение на лихвения спред. Въпреки че е налице положителна зависимост между лихвения спред и съотношението на банковите резерви към депозитите, този

ефект не е икономически значим. Състоянието на капиталовата позиция и пазарният дял не оказват статистически значимо влияние върху динамиката на лихвения спред.

## Приложение

### Основни идеи в модела на *Ho* и *Saunders* (1981)

*Ho* и *Saunders* (1981) предлагат теоретичен модел за формирането на лихвения спред, основно място в който се отделя на несигурността, съпътстваща ролята на банката като посредник между икономическите агенти, предлагащи депозити, и тези, които изпитват необходимост от заемни средства. В първоначалната си версия моделът е фокусиран върху посредническата функция на банката на пазара на ликвидни средства, като е игнорирано влиянието на кредитния риск и оперативните разходи.

Ключово място в модела има допускането, че в рамките на периода се осъществява само една трансакция с размер $Q$, като предварително не е известно дали тя ще бъде под формата на привлечен депозит или отпуснат кредит. По този начин банката е изправена пред несигурност, тъй като моментът, в който постъпват ликвидни средства, се различава от този, в който се получава искане за отпускане на кредит. Поради стохастичния характер на кредитите и депозитите банката е изправена пред риска да реализира ликвиден дисбаланс, произтичащ от свръхтърсене на кредити или недостатъчно привлечени депозити, който тя може да неутрализира със заемането или предлагането на ликвидни средства на паричния пазар. Прибягването до паричния пазар обаче е свързано с лихвен риск. Ако търсенето на кредити надхвърля предлагането на депозити, банката ще се финансира от паричния пазар по цена, по-висока от лихвения процент по депозитите, като ще бъде изправена пред риска цената на нейното финансиране да се повиши при нарастване на лихвеното ниво на паричния пазар. Аналогично, при превишение на депозитите над кредитите банката ще пласира излишъка от ликвидни средства на паричния пазар по цена, по-ниска от лихвения процент по кредитите, поемайки и риска от евентуално бъдещо понижение на лихвеното ниво на паричния пазар.

От посоченото дотук става ясно, че моделът на *Ho* и *Saunders* (1981) разглежда банката като пасивен участник на финансовия пазар, доколкото инициативата за трансакциите принадлежи

на клиентите. Разполагайки обаче с възможността да променя предлаганите от нея цени по кредитите и депозитите, банката е в състояние индиректно да влияе върху търсенето на банковите продукти. В началото на периода тя обявява лихвените проценти, по които ще привлича депозити и отпуска кредити, като ги определя, налагайки такси под формата на отбив, съответно надбавка, над очакваното лихвено ниво на паричния пазар:

$$r_D = r - a$$
$$r_L = r + b,$$

където $r_D$ и $r_L$ са съответно лихвените проценти по депозитите и кредитите, $r$ е лихвеното равнище на паричния пазар, а $a$ и $b$ са таксите, които банката налага на потенциалните депозанти и кредитополучатели, за да минимизира риска от дисбаланс между предлагането на депозити и търсенето на кредити. *Ho* и *Saunders* (1981) разглеждат лихвения спред $s$ като сума от тези такси:

$$s = a + b$$

Вероятностите за предоставяне на кредит и постъпване на депозит зависят от таксите, които банката налага на своите клиенти, както и от еластичността на търсенето на кредити/предлагането на депозити. Тези вероятности са описани като независими процеси на Поасон, които са намаляващи функции на налаганите от банката такси $a$ и $b$. *Ho* и *Saunders* (1981) използват симетрични линейни спецификации за тези вероятности:

$$\phi_L = \alpha - \beta b$$
$$\phi_D = \alpha - \beta a$$

С повишаването на таксата $b$ лихвеният процент по кредитите се увеличава и тяхното търсене отслабва, а нарастването на $a$ означава по-нисък лихвен процент по депозитите и съответно води до по-слабо предлагане на депозити. Така промяната на таксите и лихвения спред могат да се използват от банката като инструмент за влияние върху вероятността от постъпване на нови депозити и търсене на нови кредити.

В модела на *Ho* и *Saunders* (1981) банката определя размера на таксите ***a*** и ***b*** така, че да максимизира очакваната полезност от нетните активи. Нейният размер в края на периода, **EU(W)**, е апроксимиран посредством разширение на Тейлър от втори ред (*second-order Taylor series expansion*) около очаквана стойност на нетните активи $\mathbf{W = E(W)}$:

$$\mathbf{EU\,(W) = U(\bar{W}) + U'\,(\bar{W})\,E\,(W - \bar{W}) + \frac{1}{2}\,U''\,(\bar{W})\,E\,(W - \bar{W})^2},$$

където е направено допускането, че функцията на полезността на банката е непрекъсната с положителна първа и отрицателна втора производна ($\mathbf{U' > 0}$ и $\mathbf{U'' < 0}$).

Както беше посочено, в рамките на периода се осъществява само една трансакция, характерът на която (постъпване на депозит или отпускане на кредит) предварително е неизвестен. Използвайки разширението на Тейлър, *Ho* и *Saunders* (1981) комбинират стойностите на очакваната полезност от нетните активи при всеки от вариантите (депозитна или кредитна трансакция), претеглени със съответните вероятности за постъпване на депозит и искане за кредит. Целта на банката е да определи таксите **a** и **b** така, че при допускане за наличието на една трансакция с предварително неизвестен характер да максимизира очакваната полезност от промяната на нетните активи:

$$\max_{a,b}\ \mathbf{EU\,(\Delta W_T) = \phi_D\,EU\,(\Delta W_T\,|deposit) + \phi_L\,EU\,(\Delta W_T\,|loan)}$$

Според резултатите от решението на оптимизационната задача оптималният размер на лихвения спред зависи от четири фактора: 1) структурата на пазара, т.е. степента на конкуренция, с която се характеризира конкретният пазар; 2) средния размер на банковите трансакции; 3) степента на колебания на лихвените проценти, и 4) степента, в която банката се стреми да избягва риска.

$$\mathbf{s = a + b} = \alpha/\beta - \frac{1}{2}\,\frac{U''}{U'}\,\sigma_I^2 Q$$

При дефиниране на коефициента за степента, в която банката се стреми да избягва риска, $\mathbf{R = -u''/u'}$

изразът за размера на оптималния лихвен спред придобива вида:

$$s = \frac{\alpha}{\beta} + \frac{1}{2} R\sigma_I^2 Q$$

Първата част от израза (α/β) отразява размера на рисково неутралния спред, т.е. спреда, който би наложила рисково неутрална банка. Той представлява съотношение между константата (α) и наклона (β) в симетричните функции на вероятността за реализиране на депозитна или кредитна трансакция. Висока стойност на α и малък размер на β намират отражение в по-висока стойност на съотношението α/β и съответно спред **(s)**. *Ho* и *Saunders* (1981) интерпретират този първи член от израза за лихвения спред като измерител на възможността за упражняване на влияние на пазара, тъй като ако банката е изправена пред сравнително нееластични функции на търсене и предлагане на пазара за банкови продукти, тя ще е в състояние да упражнява пазарно влияние и да реализира по-висок спред, отколкото при силно конкурентен пазар.

Вторият член от израза за лихвения спред отразява рисковата премия и се състои от три елемента: коефициента на стремежа за избягване на риска **(R)**, вариацията на лихвения процент по нетната експозиция към клиентите $(\sigma_I^2)$ и размера на депозитната/кредитната трансакция **(Q)**.

В заключение, в модела на *Ho* и *Saunders* (1981) лихвеният спред е инструмент, с който банката се стреми да неутрализира ефекта от несигурността по отношение на момента на осъществяване на трансакциите и липсата на синхрон между предлагането на депозити и търсенето на кредити.

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# Лихвените проценти по кредитите в България: ролята на монетарните условия в еврозоната и влиянието на икономическата активност

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Резюме. Предмет на изследването е процесът на формиране на лихвените проценти по кредитите в България. Докато стандартните подходи за изучаване на този процес акцентират върху влиянието на условията на паричния пазар, целта на настоящото изследване е да адаптира тази методология към особеностите на местната среда, като се отчитат ролята на монетарните условия в еврозоната и на стопанската конюнктура в страната. Влиянието, което тези променливи оказват върху лихвените проценти по кредитите в България, е оценено в рамките както на симетрични, така и на асиметрични модели с корекция на грешката. Анализирани са различни лихвени проценти от гледна точка на секторна принадлежност на кредитополучателите, валутна деноминация и матуритет на кредитите, като са идентифицирани разликите в чувствителността на лихвените проценти по обособените според тези критерии видове кредити.

Abstract. The study explores the loan interest rate pass-through in Bulgaria. While standard approaches in the literature focus on the impact of changes in the money market rate, this study aims to adapt the methodology to the characteristics of interest rate pass-through in Bulgaria by taking into account the developments in the monetary conditions in the euroarea and the domestic business climate. The impact of these determinants of loan interest rates is quantified using both symmetric and asymmetric error-correction models. Interest rate pass-through analysis is performed across sectoral, currency and maturity breakdowns of loans, and key features of the respective credit market segments are identified.

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## Съдържание

## Въведение

Динамиката на лихвените проценти по кредитите и депозитите на банките традиционно е обект на засилен интерес от страна както на научните среди, така и на институциите, отговорни за провеждането на икономическата политика. Лихвените нива се отразяват върху решенията на икономическите агенти по отношение на инвестициите, потреблението и спестяванията, като необходимостта от изучаването на този въпрос е ясно изразена в страните, в които финансовата система е доминирана от банковия сектор.

Формирането на лихвените проценти по предлаганите от банките кредити и депозити е от особен интерес за централните банки. От една страна, важността на проблема произтича от ключовото място на лихвените проценти в предавателния механизъм на паричната политика, необходимостта от познаването на който е свързана с провеждането на паричната политика и целта на централните банки да поддържат ценова стабилност. Независимо дали се изразяват в използването на традиционни инструменти (каквито са лихвените проценти при операциите по рефинансиране), или на нестандартни мерки (например увеличаване на паричната база чрез изкупуване на активи), операциите на централните банки със самостоятелна парична политика намират отражение върху лихвените проценти на паричния пазар, които на свой ред влияят върху лихвените проценти по предлаганите от банките кредити и депозити. По същество това представлява първата фаза на предавателния механизъм на паричната политика. По-нататък решенията на икономическите агенти за инвестиции, потребление и спестявания, взети на база лихвените нива, се отразяват върху икономическата активност и ценовата динамика. Фактът, че от първата фаза на предавателния механизъм на паричната политика зависи до голяма степен функционирането на отделните канали на парична трансмисия, подчертава значението, което има познаването на процесите на формиране на лихвените проценти по банкови кредити и депозити за провеждането на паричната политика.

Изучаването на процесите, свързани с формирането на лихвените проценти по кредити и депозити, е от голямо значение и за страните с монетарен режим, изключващ възможността за провеждане на самостоятелна парична политика, какъвто е паричният съвет. В този случай въпросът за връзката на

лихвените проценти по банкови продукти с лихвените нива по инструментите на централната банка или с лихвения процент на местния паричен пазар се замества от друг въпрос – как и в каква степен паричните условия в страната/зоната на резервната валута намират отражение върху лихвените проценти по кредити и депозити в местната банкова система. Например, когато се анализират влиянието на външната среда върху българската икономика и формирането на очакванията за бъдещия размер на макроикономическите индикатори, е необходимо да се познават степента и скоростта, с които монетарните импулси от паричната политика на ЕЦБ се отразяват върху лихвените проценти по продукти на българския банков сектор.

Втората причина за значението, което изследването на структурата на банковите лихвени проценти има за централната банка, е свързана с нейния ангажимент да поддържа финансовата стабилност. Динамиката на банковите лихвени проценти има значение за макропруденциалната политика и анализа на финансовата стабилност по две причини. Първо, размерът на лихвените проценти по кредитите е пряко свързан с величината на кредитния риск, на който е изложена банковата система. При равни други условия повишаването на лихвените проценти по кредити се отразява негативно върху способността на кредитополучателите да обслужват задълженията си и следователно изостря кредитния риск. Второ, динамиката на лихвените проценти по кредити и депозити има определяща роля за размера на лихвения спред и нетния лихвен доход, а от него до голяма степен зависи финансовият резултат на банковата система. Когато генерираният от нетния лихвен доход финансов резултат се използва за увеличаване на капиталовата база, това укрепва буферите, с които банковият сектор може да противодейства на рисковете за финансовата система.

При моделирането на лихвените проценти по кредитите основно внимание се обръща на тяхната реакция спрямо промените в лихвените нива по инструментите на централната банка или в цената на ресурсите на паричния пазар (т.нар. прехвърляне/пренасяне на лихвените равнища, или *interest rate pass-through*). Този процес стои в основата на теоретичните модели за формирането на банковите лихвени проценти и служи като рамка при техния емпиричен анализ. В настоящото изследване е направен опит да се приложи този тип анализ по отношение на лихвените проценти по банкови кредити в България, като за

целта стандартните подходи при изучаването на връзката им с монетарните условия са адаптирани към характеристиките на местната среда. Първата особеност е свързана с избора на индикатора за монетарните условия, спрямо промените в който се измерва реакцията на лихвените проценти по кредитите. Докато при страните със самостоятелна парична политика обект на изследване са степента и скоростта, с които промените в лихвените нива по инструментите на централната банка или лихвения процент на паричния пазар се пренасят върху банковите лихвени проценти, при паричен съвет актуалният въпрос е как и в каква степен монетарните условия в страната/зоната на резервната валута намират отражение върху лихвените проценти по кредити в местната банкова система. По тази причина вместо да се анализира реакцията към измененията в лихвения процент на паричния пазар, предмет на анализ са степента и скоростта, с които лихвените равнища по различните видове кредити в България се адаптират към промените в цената на ресурсите на паричния пазар в еврозоната. Познаването на тези процеси би могло да се използва, когато се анализират влиянието на външната среда върху българската икономика и формирането на очакванията за бъдещите стойности на макроикономическите индикатори.

Втората особеност е, че за разлика от преобладаващата част от изследванията в тази област тук наред с монетарните условия е отчетена ролята и на кредитния риск като фактор при формиране цената на заемните ресурси. Този въпрос заслужава внимание с оглед значителните промени в икономическата конюнктура през последните години и започналото през 2008 г. отражение на глобалната финансова криза върху българската икономика. Влиянието на кредитния риск е отчетено косвено посредством третирането на съставния индикатор за бизнес климата като обяснителен фактор за динамиката на лихвените проценти по кредити. В основата на това стои допускането, че по-благоприятната стопанска конюнктура създава условия за по-добра кредитоспособност на длъжниците, намалява кредитния риск в икономиката и в крайна сметка води до понижение на изискваната от банките рискова премия в цената на заемните ресурси.

В това изследване лихвените проценти по кредитите са моделирани в рамките на модели с корекция на грешката, което дава възможност да се разграничат краткосрочната и дългосрочната реакция спрямо промените в обуславящите ги фактори. Наред с базовата е предложена и алтернативна спецификация, чиято цел

е да провери дали реакцията на лихвените проценти по кредитите се характеризира с асиметрия в зависимост от посоката на промените в лихвеното ниво на паричния пазар в еврозоната, както и дали лихвените проценти по кредити се придвижват към дългосрочното си равновесие с различна скорост в зависимост от знака на съответното отклонение. Анализът обхваща различни лихвени проценти от гледна точка на секторна принадлежност на кредитополучателите, валутна деноминация и матуритет на кредитите, като са идентифицирани разликите между обособените според тези критерии видове кредити.

Изложението е структурирано, както следва. Втората част предлага преглед на теоретичните модели за формирането на банковите лихвени проценти, теориите за негъвкавостта на лихвените проценти по кредитите, както и обзор на методологически въпроси в емпиричните изследвания за връзката на банковите лихвени проценти с лихвеното ниво на паричния пазар. В третата част са описани източниците и обхватът на данните, използвани в настоящото изследване, като въз основа на тях е предложен и дескриптивен анализ на зависимостите между разглежданите променливи. Четвъртата част съдържа резултатите от проведения в изследването иконометричен анализ, по-конкретно резултатите от тестовете за статистическите характеристики на данните, оценките за дългосрочната връзка на лихвените проценти по различните видове кредити с обясняващите ги променливи, както и резултатите от стандартни и асиметрични модели с корекция на грешката. Накрая, в заключението са обобщени изводите от изследването.

## Съществуваща теория и методология

### *Теоретични модели за формирането на банковите лихвени проценти и за връзката им с лихвеното ниво на паричния пазар*

Като изходна точка при изучаването на ценовата политика на банките обикновено се използват изследванията на *Klein* (1971) и *Monti* (1972), които са фокусирани върху моделирането на поведението на банките. *Freixas & Rochet* (2008) използват идеите в тези модели, за да представят ценовата политика на банките при различни режими на конкуренция. Започвайки с двете противоположни състояния на съвършена конкуренция и на монопол, те представят и по-общ модел,

който може да се използва при анализа на поведението на банките при различни видове структура на пазара.

В представената от *Freixas & Rochet* (2008) версия на модела на *Monti–Klein* банката привлича депозити и отпуска кредити, като се стреми да максимизира печалбата си през текущия период. Обект на решение от страна на банката са стойността на кредитите **L** и обемът на депозитите **D**. Разликата между обемите на кредитите и депозитите включва две части: минимални задължителни резерви **R**, които се определят в размер на $\alpha$ процента от депозитите и се поддържат в централната банка, както и нетната (положителна или отрицателна) позиция на банката на паричния пазар **M**, към който тя прибягва, когато изпитва необходимост от допълнителни средства или е в състояние на свръхликвидност. Счетоводното равенство между позициите в баланса на банката може да се представи в следния вид:

$$\mathbf{L + R = D + M}\text{, или} \quad (1.1)$$

$$\mathbf{L + \alpha D = D + M} \quad (1.2).$$

В модела се допуска, че банката разполага с възможност да влияе върху ценовото равнище на кредитния и депозитния пазар, т.е. тя определя лихвения процент по кредитите $\mathbf{r_L}$ и лихвения процент по депозитите $\mathbf{r_D}$. Търсенето на кредити $\mathbf{L(r_L)}$ се понижава при нарастване на лихвения процент по кредитите, а предлагането на депозити $\mathbf{D(r_D)}$ е в права зависимост с плащаната от банката цена за привлечените депозити. Нека $\mathbf{r_L(L)}$ **и** $\mathbf{r_D(D)}$ са обратните функции съответно на търсенето на кредити и предлагането на депозити, пред които банката е изправена. Лихвеният процент на паричния пазар ***r*** се приема за външно зададен, като се очаква неговата стойност да се намира между лихвения процент по кредитите и лихвения процент по депозитите. В модела е направено допускането, че лихвеният процент на паричния пазар отразява цената за финансиране на кредитите и алтернативната цена на депозитите. Идеята е, че лихвеният процент на паричния пазар е най-точният измерител за пределната цена на финансирането.

При осъществяването на дейността си по привличане на депозити и отпускане на кредити банката прави разходи, равнището на които може да се опише с функцията **C(D,L)**. Нека приемем, че тази функция е линейна и че разходите по която и да е от дейностите на банката не влияят върху размера на разходите по другите дейности. При тези условия функцията на разходите има вида:

$$\mathbf{C(L,D) = \gamma_L L + \gamma_D D} \quad (2),$$

където параметрите $\gamma_L$ и $\gamma_D$ са постоянни величини и отразяват

пределните разходи на банката съответно за отпускане на кредити и привличане на депозити:

$$\gamma_L = \frac{\partial C(L,D)}{\partial L} \quad \text{и} \quad \gamma_D = \frac{\partial C(L,D)}{\partial D} \tag{3}.$$

Целта на банката е да максимизира размера на печалбата π:

$$\pi = \pi(L,D) = r_L(L)L - r_D(D)D - [L + (\alpha - 1)D]r - C(D,L) \tag{4}.$$

След преобразуване на израза за печалбата, той приема вида:

$$\pi = \pi(L,D) = (r_L(L) - r)L + (r(1 - \alpha) - r_D(D))D - C(D,L) \tag{5},$$

т.е. печалбата на банката може да се представи като сума от маржовете на кредитите и депозитите, намалена с разходите за дейността.

При допускане, че функцията на печалбата π е вдлъбната, нейният размер се максимизира, когато са изпълнени следните условия:

$$\frac{\partial \pi}{\partial L} = r_L'(L)L + r_L - r - \gamma_L = 0 \tag{6}$$

$$\frac{\partial \pi}{\partial D} = -r_D'(D)D + r(1 - \alpha) - r_D - \gamma_D = 0 \tag{7}.$$

Нека $\varepsilon_L$ и $\varepsilon_D$ са еластичностите съответно на търсенето на кредити и предлагането на депозити:

$$\varepsilon_L = -\frac{r_L L'(r_L)}{L(r_L)} > 0 \quad \text{и} \quad \varepsilon_D = \frac{r_D D'(r_D)}{D(r_D)} > 0 \tag{8}.$$

При заместване на изразите за еластичностите в условията за максимизиране на размера на печалбата, решението на оптимизационната задача $(r_L^*, r_D^*)$ е:

$$r_L^* = (r + \gamma_L)\frac{1}{1 - \frac{1}{\varepsilon_L(r_L)}} \tag{9}$$

$$r_D^* = [r(1 - \alpha) - \gamma_D]\frac{1}{1 + \frac{1}{\varepsilon_D(r_D)}} \tag{10}.$$

Получените изрази показват, че оптималното ниво на лихвения процент по кредитите се намира в права зависимост с лихвения процент на паричния пазар и пределните разходи за кредитната дейност и в обратна зависимост с еластичността на търсенето на кредити. Лихвеният процент по депозитите нараства при увеличение на лихвения процент на паричния пазар и

на еластичността на предлагането на депозити и се понижава при по-високо равнище на пределните разходи на банката за привличане на депозити и процента на минималните задължителни резерви.

Ако се допусне, че еластичностите на търсенето на кредити и предлагането на депозити са константи, производните на лихвените проценти по кредитите и депозитите по отношение на лихвения процент на паричния пазар могат да бъдат изразени по следния начин:

$$\frac{\partial \mathbf{r_L}^*}{\partial \mathbf{r}} = \frac{\mathbf{1}}{\mathbf{1} - \frac{\mathbf{1}}{\varepsilon_L}} \tag{11}$$

$$\frac{\partial \mathbf{r_D}^*}{\partial \mathbf{r}} = \frac{(\mathbf{1}-\alpha)}{\mathbf{1} + \frac{\mathbf{1}}{\varepsilon_D}} \tag{12},$$

т.е. колкото по-висока е еластичността на търсенето на кредити, толкова по-слабо чувствителен е лихвеният процент по кредитите към промени в лихвеното ниво на паричния пазар. Чувствителността на лихвения процент по депозитите спрямо изменения в цената на ресурсите на паричния пазар нараства при увеличение на еластичността на предлагането на депозити и се понижава при по-висок процент на минималните задължителни резерви.

Горният модел описва поведението на банка с монополно положение на пазара. *Freixas & Rochet* (2008) представят и олигополна версия на модела в условията на равновесие на Курно *(Cournot equilibrium)*, в която те показват, че банковите лихвени проценти и производните им спрямо лихвения процент на паричния пазар зависят не само от размера на еластичностите на търсенето на кредити и предлагането на депозити, но и от броя на банките, които функционират на пазара. Единствената разлика между случаите на монопол и на олигополен пазар в условията на равновесие на Курно е, че във втория случай еластичностите в горните изрази се умножават по броя на банките **N**. Адаптиран по този начин, моделът на *Monti–Klein* може да се интерпретира като описание на най-общ случай на пазарната структура, където при **N = 1** е налице монопол, а при **N = +∞** пазарът се характеризира със съвършена конкуренция. *Freixas u Rochet* (2008) показват, че когато броят на банките **N** нараства, $\mathbf{r_L}^*$ (съответно $\mathbf{r_D}^*$) става по-слабо (съответно по-силно) чувствителен към промени в лихвения процент на паричния пазар **r**.

Когато разходите на банката се приемат за адитивни, както в настоящото изложение, моделът на *Monti–Klein* разглежда ценовата политика по кредитите и определянето на лихвения процент по депозитите като обекти на независими едно от друго решения. С други думи, приема се, че нивото на оптималния лихвен процент по депозитите не зависи от характеристиките на кредитния пазар, а оптималното равнище на лихвения процент по кредитите не се влияе от условията на пазара на депозити. Това важно допускане се използва широко в литературата, като то служи за основа за използването на отделни уравнения за лихвените проценти по кредитите и по депозитите.

Друго ограничение на модела във *Freixas & Rochet* (2008) е, че в него не е отразено наличието на кредитен риск. В литературата това обикновено се осъществява, като обемът на кредитите се умножи с израза **(1 – μ)**, където **μ** е екзогенно зададена случайна променлива, заемаща стойност в интервала от нула до единица, която отразява дела на необслужваните кредити в края на периода или вероятността банката да претърпи загуба по вземанията си от кредитополучатели (*Putkuri*, 2010). Когато моделът се адаптира с това допълнение, изводът е, че колкото по-силен е кредитният риск, толкова по-високо е равнището на лихвените проценти по кредитите и по-силна тяхната чувствителност към промени в лихвения процент на паричния пазар.

## *Теории за негъвкавостта на банковите лихвени проценти*

В тази част от изследването е направен преглед на теоретичните обяснения защо в много случаи лихвените проценти по кредити са негъвкави и не се движат паралелно с разходите за предоставяне на банков кредит.

### 1) Избягване на кредитополучатели с неблагоприятни рискови характеристики (adverse selection)

*Stiglitz & Weiss* (1981) показват, че когато има асиметрия на информацията между банката и длъжниците, лихвеният процент по кредитите се характеризира с негъвкавост, тъй като банките не желаят да се отклонят от това негово ниво, което максимизира очакваната възвръщаемост от кредитите. Според допускането за наличие на асиметрична информация между банките и длъжниците кредитополучателят знае степента на риска на своя проект, докато банката не е в състояние да прави разлика

между отделните проекти. При тези условия увеличението на лихвения процент по кредитите може да предизвика два ефекта върху рисковите характеристики на кредитополучателите. Първият ефект (*adverse selection*) възниква, защото като цяло кредитополучателите, които са склонни да плащат по-висок лихвен процент, са с по-лоши рискови характеристики. В резултат на това съставът на потенциалните кредитополучатели се изменя в неблагоприятна посока. Вторият ефект е резултат от това, че кредитополучателите, изправени пред по-високи лихвени проценти, са склонни да предприемат проекти с по-висок риск (*moral hazard*). Проблемите, възникнали вследствие на асиметричната информация, стават причина увеличение на лихвения процент по кредитите да не води до нарастване в същия размер на очакваните приходи на банката. Нещо повече, ако вероятността за неизпълнение на кредитното задължение нарасне значително, очакваните приходи на банката от него могат да започнат да спадат, когато лихвеният процент по кредитите премине определено оптимално ниво. Повишението на лихвения процент по кредитите над определено равнище би намалило очакваната възвръщаемост, тъй като кредитополучателите, които са склонни да поемат по-високо лихвено бреме, вероятно са с по-лоши от средното рискови характеристики, а съществуващите длъжници биха избрали по-рискови проекти, когато са изправени пред по-висок лихвен процент по кредитите. За да не се отклонят от оптималното равнище, банките не биха предприели повишение на лихвения процент по кредитите дори и при нарастваща цена на привлечените ресурси, като вместо това биха предпочели да ограничат количеството на отпуснатите кредити. В такова равновесие лихвеният процент по кредитите се характеризира с негъвкавост във възходяща посока.

Изводът за негъвкавост на лихвения процент по кредитите обаче не е в сила при равновесие, в което няма количествени ограничения за кредитите. Да допуснем, че има два типа потенциални кредитополучатели. Нека вероятността за неизпълнение на кредитното задължение за първия тип длъжници е нула, докато за втория тип съответната вероятност е положителна и се увеличава с нарастване на лихвения процент по кредитите. Да допуснем, че банката е неутрална спрямо риска и се стреми да получи еднаква възвръщаемост и от двата типа кредити. При първата група кредитополучатели (безрисковите длъжници) промените в цената на привлечените

от банката средства се пренася изцяло върху лихвения процент по кредитите. Ако обаче банката отпуска кредити на втория тип кредитополучатели, за тези кредити банката ще трябва да увеличи лихвения процент повече, отколкото е нарастването на цената на привлечените средства. Това е необходимо, за да се компенсира по-ниската вероятност за изплащане на задължението. При определено равнище на лихвения процент банката няма да е в състояние да покрие риска и всички кредити ще бъдат отпуснати на първата група кредитополучатели. Докато настъпи този момент обаче, лихвеният процент по рисковите кредити няма да се характеризира с негъвкавост. Точно обратното, той ще бъде силно чувствителен към промените в цената на привлечените от банката средства.

**2) Алтернативна теория за избягването на кредитополучатели с неблагоприятни рискови характеристики**

Докато теорията на *Stiglitz & Weiss* (1981) предвижда, че лихвените проценти по кредити са негъвкави във възходяща посока, *Ausubel* (1991) предлага напълно различна теория, която обяснява нежеланието на банките да понижават лихвените проценти по кредити. Той прилага теорията си по отношение негъвкавостта на лихвения процент на пазара на задължения по кредитни карти, разглеждайки два типа кредитополучатели на този пазар. Първата група обхваща тези, които предварително нямат намерение да получават такива заеми, разполагат с широк кръг алтернативни източници на финансиране и не отлагат изпълнението на задълженията си по кредитната карта за следващ период. Тези потребители не са чувствителни към промени в лихвения процент и са групата кредитополучатели, към които банките се стремят: те заемат при високи лихвени проценти и редовно обслужват кредитите, които са получили. Потребителите от първата група не реагират на намаление на лихвения процент по кредитите, тъй като предварително не възнамеряват да получават кредити. Наред с това има и втора група потребители, които планират да поемат задължения по кредитните си карти и да отлагат изпълнението на задълженията си за следващ период. Тези потребители се характеризират с повишен кредитен риск и заради това не разполагат с по-евтини алтернативи за финансиране; кредитните карти са най-добрият им източник на финансиране. Кредитополучателите от втората група са чувствителни към промени в лихвения процент, тъй като имат намерение да поемат значителни задължения по кредитните си карти. При така

зададената ситуация банките няма да са склонни да понижат лихвения процент по кредитите, тъй като по-ниската цена на заемните ресурси би привлякла групата потребители, които са с влошени рискови характеристики и планират да използват кредитните си линии. По този начин лихвените проценти по кредитните карти ще се характеризират с негъвкавост в низходяща посока.

**3) Разходи, свързани с промяна на финансиращата банка (switching costs)**

Негъвкавостта на лихвения процент по кредитите в низходяща посока може да е резултат и от разходите, пред които са изправени кредитополучателите при смяна на финансиращата банка. В процеса на отпускане и наблюдение на кредитите банките събират подробни данни за своите клиенти, за да определят рисковия им профил. Събирането на тази информация е свързано със значителни разходи, които банките прехвърлят върху кредитополучателите посредством налагането на такса за разглеждането на молбите за кредити. Тъй като информацията се събира отново, когато кредитополучателят се обърне за финансиране към друга банка, съществуването на такса прави скъпо за клиентите преминаването от една банка към друга. Наред с това смяната на източника на финансиране е съпътствана от допълнителни разходи, например разходи по събирането на информация за условията на кредитите в различните банки, попълването на искане за кредит, получаването на необходимата документация, както и времето за интервю при кредитния инспектор. В известен смисъл кредитополучателите са обвързани със своята банка дотогава, докато разликата в лихвените проценти на отделните банки стане толкава голяма, че да прави изгодна смяната на източника на финансиране. *Klemperer* (1987) показва, че наличието на разходи по смяната на доставчика води до сегментация на пазара и понижава еластичността на търсенето на фирмата, в резултат на което производната на цената по отношение на пределните разходи става по-ниска от единица.

**4) Дългосрочни взаимоотношения**

Банките може да не желаят да повишат лихвените проценти по кредитите от съображения за запазване на дългосрочните взаимоотношения с клиентите. *Laudadio* (1987) посочва дългосрочните връзки между банките и техните клиенти като обяснение за негъвкавостта на лихвените проценти по малките кредити. Той показва, че когато връзката между банката и кредитополучателя

е силна, банката може да не е склонна да прехвърли увеличението в цената на привлечените ресурси върху лихвения процент по кредитите, ако това увеличение може да причини негативни ефекти върху състоянието на кредитополучателя или да предизвика нарушаване на дългосрочните взаимоотношения. Същевременно длъжниците не биха рефинансирали задълженията си към обслужващата ги банка с кредит от друг източник на финансиране, дори ако тя не предприеме намаление на лихвения процент по кредита при понижение в цената на привлечените от нея ресурси. Причината е, че ако предприеме такава стъпка, кредитополучателят ще претърпи загуба на ползи, каквито не може да получи бързо от конкурентните банки.

**5) Подялба на риска (risk sharing)**

Разглеждайки негъвкавостта на лихвените проценти по кредитите в контекста на количествените ограничения на кредитния пазар, *Fried & Howitt* (1980) твърдят, че негъвкавостта на лихвения процент по кредитите може да е резултат от имплицитно споразумение между банките и техните длъжници, целта на което е подялба на риска помежду им. Ако кредитополучателят не желае да поема риск и предпочита лихвените му плащания да са стабилни, банката може да му предложи лихвен процент по кредита, който се колебае в по-малка степен в сравнение с пределната цена на привлечените средства. За допълнително поетия риск банката ще изисква по-висок лихвен процент по кредита в сравнение с този за длъжниците, неутрални към риска. Тези споразумения наподобяват договорите за застраховка, в които склонната да поеме риск страна поема срещу заплащане някои от рисковете, на които е изложена другата страна по договора. Аналогично, неутрална към риска банка може да застрахова своите длъжници срещу риска от големи колебания на лихвения процент посредством политика на поддържане на по-слабо променящи се лихвени плащания, в замяна на което клиентите ще са склонни да компенсират банката с плащането на по-висок от обичайния лихвен процент по кредитите. Тези имплицитни споразумения ограничават движението на лихвените проценти и може да създадат предпоставки за налагане на количествени ограничения по отношение на отпуснатите кредити.

**6) Административни разходи по промяната на цените (administrative/menu costs)**

*Mester & Saunders* (1991) моделират решението на банката да предприеме промяна на лихвения процент по кредитите,

като експлицитно отчитат фиксираните и променливите административни разходи, свързани с тази промяна. Те показват, че при наличието на такива разходи лихвеният процент по кредитите ще се характеризира с негъвкавост по отношение цената на привлечените от банката средства.

**7) Структура на пазара (market structure)**

На пазарите с висока концентрация банките са в състояние да отлагат изменението на лихвените проценти с цел по-висока норма на печалбата. Използвайки модел за пазара на банкови депозити, *Hannan & Berger* (1991) показват, че степента на ценова негъвкавост е свързана с равнището на концентрация на пазара, както и че тази негъвкавост зависи от посоката на изменение на лихвените проценти. *Neumark & Sharpe* (1992) също изучават поведението на лихвените проценти по банкови депозити и стигат до заключението, че те са негъвкави. *Neumark & Sharpe* (1992) обясняват този факт с упражняването от страна на банките на монополно влияние, с наличието на разходи за банките при промяна на лихвените проценти и на разходи за вложителите при смяна на обслужващата ги банка. Друго заключение от изследването е, че на пазари с висока концентрация банките увеличават лихвените проценти по депозитите по-бавно в сравнение с пазарния лихвен процент, както и че понижават лихвените проценти по депозитите бързо, когато е налице намаление на пазарните лихвени проценти.

В заключение, негъвкавостта на лихвените проценти по кредитите може да се обясни с някоя или с всички следни причини: стремеж от страна на банките да избегнат привличане на кредитополучатели с неблагоприятни рискови характеристики; административни разходи, свързани с промяната на лихвените проценти; разходи за кредитополучателите при смяна на финансиращата ги банка; стремеж на банките да запазят дългосрочните си взаимоотношения с клиентите; ролята на банките имплицитно да застраховат своите длъжници срещу лихвен риск; концентрацията на пазара на банкови кредити. За да предприеме дадена банка промяна на лихвените проценти по кредитите, е необходимо очакваните ползи от нея да надхвърлят разходите по извършването ѝ. Ползите и разходите може да са различни за всяка банка в зависимост от това дали тя обмисля увеличение или намаление на лихвения процент.

*Mester & Saunders* (1995) използват модел, при който банката предприема промяна на лихвения процент по кредитите само когато

оптималното му ниво се отклонява в такава степен от текущото равнище, че изменението би покрило направените във връзка с нея разходи. Авторите интерпретират разходите по промяната в широк смисъл, като включват в тях не само преките, но и непреките разходи, пред които е изправена банката (вероятност да привлече кредитополучатели с неблагоприятни рискови характеристики, вероятност да бъдат нарушени дългосрочните връзки с клиентите и т.н.). Вероятността да бъде променен предложеният от банката лихвен процент по кредитите е функция на пазарните условия, които влияят върху оптималното ниво на лихвения процент, и на размера на разходите за достигането му. Колкото по-големи са тези разходи, толкова по-малка е вероятността банката да промени предлагания лихвен процент по кредитите при дадено изменение на оптималното му ниво. Доколкото разходите, свързани с увеличаването на лихвения процент по кредитите, се различават от разходите за понижаването му, е възможно в ценовата политика на банката да се наблюдава асиметрия.

## *Методологически въпроси в емпиричните изследвания за връзката на банковите лихвени проценти с лихвеното равнище на паричния пазар*

В литературата за формирането на лихвените нива по кредити и депозити централна роля заемат тенденциите в лихвения процент на паричния пазар. Той представлява важен компонент на пределните разходи на банките и се намира под прякото въздействие на нивото на лихвените проценти при операции на централната банка на съответната държава по рефинансиране, операции на централната банка на съответната държава или на страната/зоната, чиято валута се използва като резервна. В резултат на това, един от основните въпроси в литературата относно предавателния механизъм на паричната политика е измерването на степента и скоростта, с която измененията в лихвеното ниво на паричния пазар се пренасят върху лихвените проценти по кредити и депозити (т.нар. *interest rate pass-through*).

Изследванията за връзката между лихвеното равнище на паричния пазар и банковите лихвени проценти се характеризират с голямо разнообразие по отношение на разглеждания период, вида и обхвата на използваните данни, прилаганата методология и спецификацията на моделите.

Реакцията на банковите лихвени проценти спрямо динамиката на лихвеното равнище на паричния пазар обикновено се установява с оценяването на модели, кръгът от променливите в които се ограничава с настоящи и лагови стойности на лихвените нива. Сравнително по-рядко срещан подход в литературата е реакцията на банковите лихвени проценти да се оценява в модели, които включват и макроикономически променливи (*Donnay & Degryse*, 2001; *Baugnet, Collin & Dhyne*, 2007; *Putkuri*, 2010; *Hristov, Hülsewig & Wollmershäuser,* 2012; *Sznajderska*, 2012).

Преобладаващата част от изследванията оценяват модели с времеви редове, като използват агрегирани данни за банковите лихвени проценти от една или няколко страни. Сред изследванията, базиращи се на агрегирани данни само от една държава, са тези на Lowe (1995) за Австралия, *Heffernan* (1997) и *Hofmann*, *Mizen* (2004) за Великобритания, *Bredin*, *Fitzpatrick*, *O'Reilly* (2001) за Ирландия, *Baugnet*, *Hradisky* (2004) за Белгия, *Burgstaller* (2005) и *Jobst*, *Kwapil* (2008) за Австрия, *Gambacorta*, *Iannotti* (2005) за Италия, *Kauko* (2005) и *Putkuri* (2010) за Финландия, *Castro*, *Santos* (2010) за Португалия, *Harbo Hansen*, *Welz* (2011) за Швеция, *Sznajderska* (2012) за Полша, *Yildirim* (2012) за Турция. *De Bondt* (2002) и *ECB* (2009) използват агрегирани данни за еврозоната като цяло, докато *Mojon* (2000), *Toolsema*, *Sturm*, de *Haan* (2002), *Sander*, *Kleimeier* (2004), *De Bondt*, *Mojon*, *Valla* (2005), *Sørensen*, *Werner* (2006), *Van Leuvensteijn*, *Sørensen*, *Bikker*, *van Rixtel* (2008), *Marotta* (2009), *Belke*, *Beckmann*, *Verheyen* (2012) и *Hristov*, *Hülsewig*, *Wollmershäuser* (2012) разглеждат група избрани държави – членки на еврозоната, за всяка от които оценяват индивидуален модел. Сред изследванията, които се фокусират върху по-голям брой страни от различни региони, са *Cottarelli*, *Kourelis* (1994), *Borio*, *Fritz* (1995) и *Gigineishvili* (2011).

Друга част от изследванията оценяват панелни модели за реакцията на банковите лихвени проценти към измененията в лихвеното ниво на паричния пазар, като използват индивидуални данни за банките в рамките на една страна. Примери за такива изследвания са *Weth* (2002), *Mueller-Spahn* (2008) и *Schlüter*, *Busch*, *Hartmann-Wendels*, *Sievers* (2012) за Германия, *De Graeve*, *De Jonghe*, *Vander Vennet* (2004, 2007) и *Baugnet*, *Collin*, *Dhyne* (2007) за Белгия, *Berstein*, *Fuentes* (2003) за Чили, *Chmielewski* (2004) за Полша, *Horvath*, *Krekó*, *Naszódi* (2004) за Унгария, *Gambacorta* (2005) за Италия, *Aydin* (2007) за Турция, *Antão* (2009) за Португалия.

В изследванията за връзката между банковите лихвени проценти и лихвеното ниво на паричния пазар се прави разграничение между краткосрочна и дългосрочна реакция на банковите лихвени

проценти. Това се осъществява в рамките на модели с корекция на грешката или посредством *ARDL* модели (*autoregressive distributed lag models*), с които е възможно да се оцени както непосредствената реакция спрямо изменение в лихвеното равнище на паричния пазар, така и предизвиканата от него реакция на банковите лихвени проценти в дългосрочен план.

В публикациите относно реакцията на банковите лихвени проценти към измененията в лихвеното ниво на паричния пазар често се проверява хипотезата за евентуална асиметрия в тази реакция. В по-ранните изследвания това се осъществява, като моделите се оценяват отделно за периоди на нарастващи и понижаващи се лихвени проценти на паричния пазар, след което получените коефициенти за различните извадки се сравняват (*Borio & Fritz*, 1995, *Mojon*, 2000). С течение на времето като основен инструмент за идентифицирането на асиметрия и нелинейност в реакцията на банковите лихвени проценти се налагат т.нар. прагови модели с корекция на грешката (*threshold error correction models*). При тях е възможно скоростта на възстановяване на дългосрочната зависимост да варира съобразно знака или размера на съответното отклонение от дългосрочното равновесие. Проверка на хипотезата за асиметрия в непосредствената реакция също е възможна, като за целта в зависимост от знака или размера на измененията в независимата променлива (лихвения процент на паричния пазар) се оценяват различни нейни коефициенти.

Често срещана констатация в литературата е, че реакцията на банковите лихвени проценти спрямо изменения в лихвеното ниво на паричния пазар се характеризира с хетерогенност сред отделните страни и банки. Редица изследвания търсят причината за тази хетерогенност, като кръгът на разглежданите фактори зависи от това дали моделите са оценени с агрегирани или индивидуални данни за отделните банки. В изследванията, базирани на агрегирани данни за няколко страни, предмет на анализ е влиянието на различни макроикономически променливи, конкуренцията и други структурни характеристики на финансовата система. От друга страна, при изследванията, използващи индивидуални банкови данни, се анализира ролята на специфичните характеристики на кредитните институции.

При анализа на причините за хетерогенността в реакцията на банковите лихвени проценти сред различните държави, коефициентите за скоростта или степента на тази реакция в

разглежданите страни обикновено се представят като функция на различни макроикономически променливи и структурни характеристики на финансовата система (*Cottarelli & Kourelis*, 1994; *Mojon*, 2000; *Sander & Kleimeier*, 2004; *Sørensen & Werner*, 2006; *Gigineishvili*, 2011). Алтернативен вариант за анализ на влиянието на даден фактор върху скоростта или степента на реакция на банковите лихвени проценти е като в модела се включи произведението (*interaction term*) на съответната променлива с пазарния лихвен процент. Например, по този начин *Van Leuvensteijn*, *Sørensen*, *Bikker & van Rixtel* (2008) оценяват влиянието на конкуренцията върху процеса на пренасяне на измененията в лихвените нива на паричния пазар върху банковите лихвени проценти.

## Източници и обхват на данните. Дескриптивен анализ

Анализът в това изследване е базиран на динамични редове с тримесечна честота за периода от началото на 1999 г. до края на второто тримесечие на 2013 г.

Данните за лихвените проценти по кредитите са с източник лихвената статистика на БНБ. Използвана е справката за лихвените проценти по новоотпуснатите кредити (т.нар. нов бизнес), като са налице три причини те да бъдат предпочетени пред лихвените нива по общия обем на съществуващите кредити (т.нар. лихвени проценти по салда). Първо, използването на лихвените проценти по нов бизнес би дало по-ясна представа за непосредствената реакция на банките към изменения в икономическата среда, докато тези по салда се характеризират със значителна инерция, тъй като в голяма степен отразяват и минали решения. Второ, информацията за лихвените проценти по салда не се отнася за целия обем на съществуващите кредити: в нейния обхват не попадат кредитите, класифицирани като „необслужвани експозиции", „загуба" и „преструктурирани експозиции" по смисъла на Наредба № 9 на БНБ за оценка и класификация на рисковите експозиции на банките и за установяване на специфични провизии за кредитен риск. Това означава, че при по-чувствително влошаване на кредитния портфейл на банковата система лихвените проценти по салда може да не отразяват тенденциите в ценовата политика на банките. Трето, в България статистиката за новоотпуснатите кредити се характеризира с много по-голяма дължина на динамичните редове, докато информацията за лихвените проценти по салдата на кредитите се събира едва от началото на 2007 г.

За целите на изследването месечните данни от лихвената статистика на БНБ са трансформирани в тримесечни, като равнището на лихвените проценти по кредитите през всяко тримесечие са получени посредством претегляне на включените в него месечни данни за лихвените проценти с обемите на новоотпуснатите през съответните месеци кредити. Причината за преминаването към по-ниска честота на данните е, че така се неутрализира влиянието на екстремните стойности в лихвените условия по отделни кредитни споразумения, което ясно се проявява при сравнително малък обем на пазара.

Данните от лихвената статистика дават възможност да бъдат използвани няколко критерия за разграничение на кредитите, лихвените проценти по които са обект на анализ. Първо, от гледна точка на секторната принадлежност на длъжниците кредитите могат да бъдат обособени на такива, отпуснати на нефинансови предприятия или на домакинства. По отношение валутната деноминация на новоотпуснатите заемни средства е необходимо да се направи уточнението, че в настоящото изследване са обхванати единствено кредитите, деноминирани в левове и в евро. Това е продиктувано от малкия дял на щатския долар във валутната структура на новоотпуснатите кредити (4.6% през 2012 г.). От гледна точка на разграничението според оригиналния матуритет на кредитите е използвана разбивката, осигурявана от лихвената статистика на БНБ до края на 2006 г., т.е. разделение на краткосрочни (матуритет до една година) и дългосрочни кредити (над една година). От началото на 2007 г. е налице и по-подробна матуритетна разбивка, но необходимостта от максимално дълги динамични редове и съпоставимост наложи данните за лихвените проценти по кредитите след 2007 г. да бъдат групирани според съществуващото дотогава разделение. Разграничението на кредитите на краткосрочни и дългосрочни е приложено само по отношение на сектора на нефинансовите предприятия, докато при домакинствата това разделение губи смисъла си, тъй като почти целият обем на отпуснатите им от банките кредити са с матуритет над една година.

Индикатор за паричните условия, спрямо чиито изменения изследването анализира реакцията на лихвените проценти по кредитите, ще бъде лихвеното равнище по междубанковите депозити в еврозоната. Този избор е продиктуван от отсъствието на самостоятелна парична политика в България, използването на еврото като резервна валута, както и от доминиращия дял на

банки от страни от еврозоната в структурата на собствеността на банковия сектор у нас. В качеството на конкретен индикатор за лихвеното равнище по междубанковите депозити в еврозоната е използван тримесечният ЮРИБОР. Поначало индексите на паричния пазар със срочност три месеца се разглеждат като индикатор за краткосрочните лихвени равнища, които отразяват както ефектите на паричната политика, така и действието на специфични фактори на междубанковия пазар.

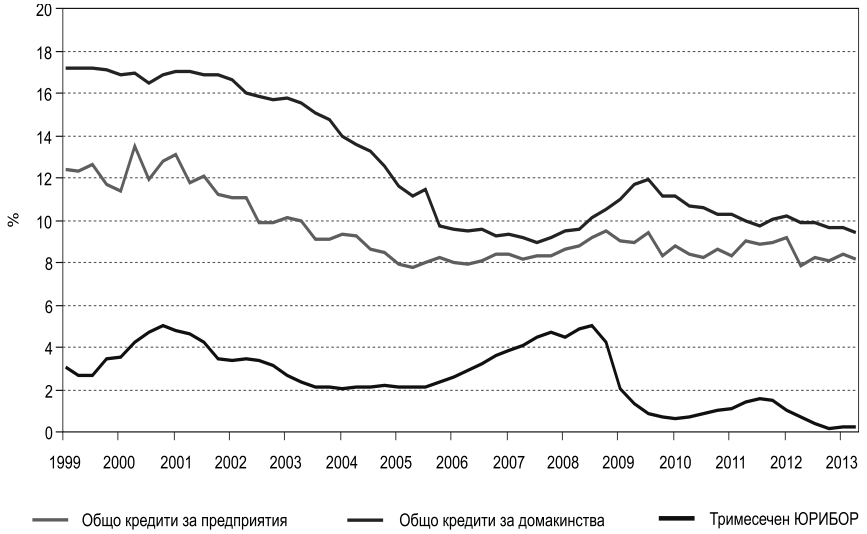
Въпреки че банките в България не използват паричния пазар в еврозоната като директен източник на финансиране на дейността си, цената на този пазар има ключово значение за динамиката на лихвените проценти по кредитите, отпускани от местната банкова система. Първо, съществува пряк механизъм за въздействие, тъй като измененията в лихвените проценти по част от кредитите (главно корпоративните) в голяма степен са обвързани директно с динамиката на ЮРИБОР. В допълнение, лихвеното равнище на междубанковия пазар в еврозоната може да се отразява върху лихвените проценти по кредитите и когато те са обвързани не с него, а с лихвеното ниво по привлечените от банките ресурси. Част от този канал на въздействие се проявява посредством средствата, които банките в България получават от кредитни институции в еврозоната. Доминиращата част от местната банкова система се състои от субсидиари или клонове на банки от еврозоната и получава част от финансирането си именно под формата на задължения към банките майки. Централите на чуждестранните банкови групи използват междубанковия пазар в еврозоната като източник на финансиране и предоставят част от него на дъщерните си кредитни институции, като измененията в цената на това финансиране до голяма степен следват динамиката на ЮРИБОР. Накрая, лихвеното равнище на междубанковия пазар в еврозоната може да се отразява върху лихвените проценти по кредитите и посредством влиянието си, оказвано първо върху цената на ресурсите, които банките привличат от местния небанков сектор. Тази цена може да се влияе от монетарните условия и съответно притока на капитали от еврозоната, с които българският небанков сектор в голяма степен е свързан чрез търговски и финансови взаимоотношения. Например, значителен дял от износа на България е ориентиран към еврозоната, а част от предприятията в страната са в състава на чуждестранни корпорации, като се финансират директно от чуждестранни банки или косвено от своите централи по механизъм, подобен на описания по-горе с банковите субсидиари.

Всички тези фактори се отразяват върху паричните потоци и разполагаемите ликвидни средства на местния небанков сектор и съответно върху цената на привлечените от банките ресурси, а оттам и върху лихвените проценти по кредитите.

Графики 1–3 представят динамиката на лихвените проценти по обособени според различни критерии видове кредити и тримесечния ЮРИБОР. Целта е да се провери визуално доколко цената на заемните ресурси в страната се движи заедно с лихвеното ниво по междубанковите депозити в еврозоната. Сравнението от гледна точка на различните видове кредити показва, че като цяло връзката с ЮРИБОР е по-ясно изразена при кредитите за предприятия, тези с матуритет до една година, както и при кредитите в евро. Прави впечатление, че връзката между лихвените проценти по кредитите в България и ЮРИБОР е по-силна до началото на 2009 г., когато започва отражението на глобалната финансова и икономическа криза върху българската икономика. От този момент до края на разглеждания период ЮРИБОР се понижава до исторически ниски стойности, които отразяват облекчаването на паричната политика от страна на ЕЦБ, докато лихвените проценти по кредитите в страната не се изменят в низходяща посока.

Графика 1

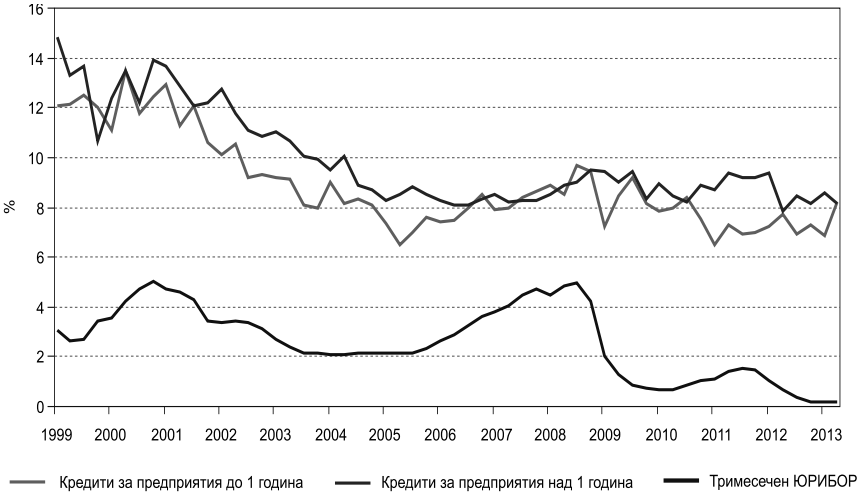
**ЛИХВЕНИ ПРОЦЕНТИ ПО НОВООТПУСНАТИ КРЕДИТИ НА ПРЕДПРИЯТИЯ И ДОМАКИНСТВА**




Източници: БНБ, ЕЦБ.

Графика 2

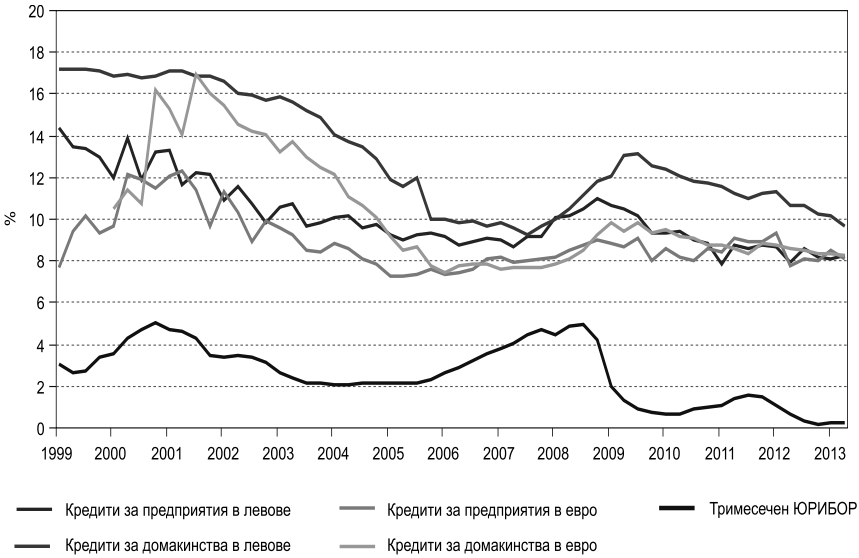
**ЛИХВЕНИ ПРОЦЕНТИ ПО КРАТКОСРОЧНИ И ДЪЛГОСРОЧНИ КРЕДИТИ ЗА ПРЕДПРИЯТИЯ**




Източници: БНБ, ЕЦБ.

Графика 3

**ЛИХВЕНИ ПРОЦЕНТИ ПО КРЕДИТИ, ДЕНОМИНИРАНИ В ЛЕВОВЕ И В ЕВРО**

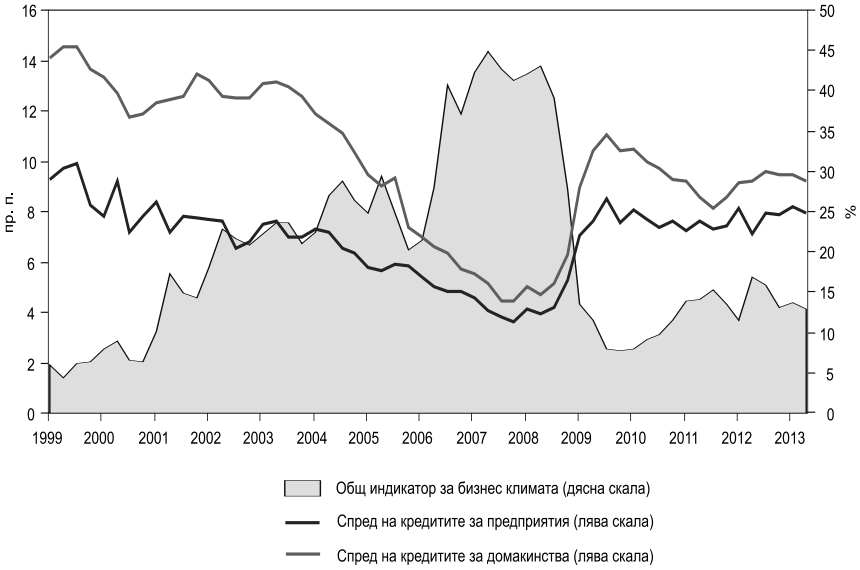



Източници: БНБ, ЕЦБ.

По-ясна представа за степента, в която тенденциите в цените на заемните ресурси в страната следват лихвените нива на междубанковия пазар в еврозоната, дават графики 4–6, където са изобразени спредовете между лихвените проценти по съответните видове кредити и тримесечния ЮРИБОР. Тези спредове не са постоянни във времето, което е сигнал, че динамиката на лихвените проценти по кредитите се определя и от други фактори, какъвто например може да бъде равнището на кредитния риск в икономиката.

Графика 4

**СЪСТАВЕН ИНДИКАТОР ЗА БИЗНЕС КЛИМАТА И СПРЕДОВЕ НА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ ЗА ПРЕДПРИЯТИЯ И ДОМАКИНСТВА СПРЯМО ТРИМЕСЕЧНИЯ ЮРИБОР**



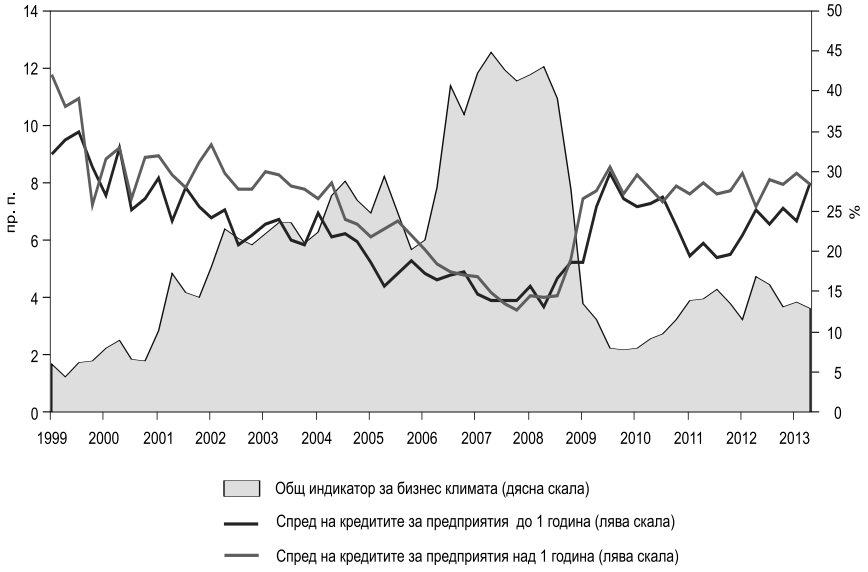

Източници: БНБ, ЕЦБ, НСИ.

При моделирането на лихвените проценти по кредитите ролята на кредитния риск често се игнорира, което вероятно е свързано и с проблема за неговото измерване. В настоящото изследване е направен опит кредитният риск да се включи като фактор за цената на заемните ресурси, като за целта неговото влияние е взето предвид косвено посредством отчитане на тенденциите в икономическата конюнктура. Въз основа на

допускането, че изискваната от банките премия за кредитен риск нараства при влошаване на икономическата среда и се понижава при нейното подобряване, в групата на независимите променливи може да се включи индикатор за стопанската конюнктура, по-конкретно изготвяният от НСИ съставен индикатор за бизнес климата в икономиката. Очакваният резултат е, че в условията на благоприятна стопанска конюнктура премията за кредитен риск и цената на заемните ресурси ще се понижават, докато при влошаване на бизнес климата те ще нарастват.

Графика 5

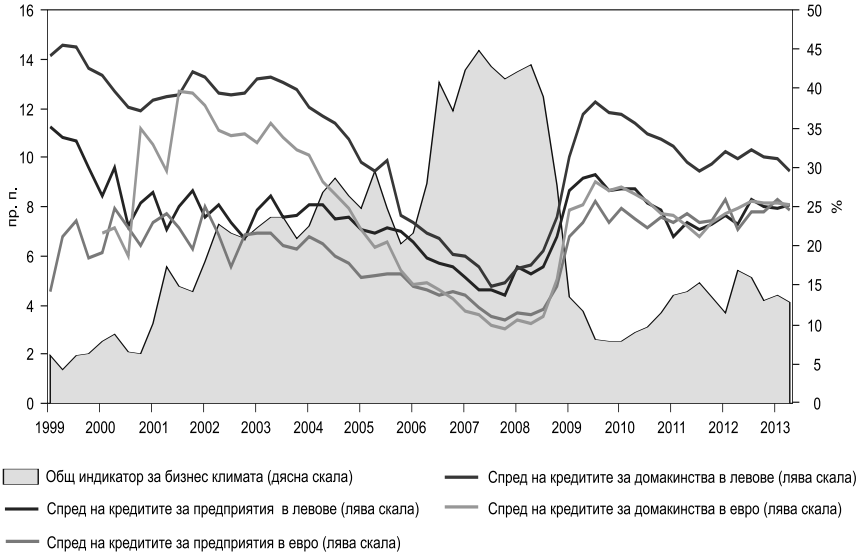
**СЪСТАВЕН ИНДИКАТОР ЗА БИЗНЕС КЛИМАТА И СПРЕДОВЕ НА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРАТКОСРОЧНИТЕ И ДЪЛГОСРОЧНИТЕ КРЕДИТИ ЗА ПРЕДПРИЯТИЯ СПРЯМО ТРИМЕСЕЧНИЯ ЮРИБОР**




Източници: БНБ, ЕЦБ, НСИ.

Графика 6

**СЪСТАВЕН ИНДИКАТОР ЗА БИЗНЕС КЛИМАТА И СПРЕДОВЕ НА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ В ЛЕВОВЕ И В ЕВРО СПРЯМО ТРИМЕСЕЧНИЯ ЮРИБОР**




Източник: БНБ, ЕЦБ, НСИ.

Очакванията за обратна връзка между състоянието на стопанската конюнктура и изискваната от банките премия за кредитен риск се потвърждават от графики 4–6, където спредовете между лихвените проценти по кредитите и тримесечния ЮРИБОР са съпоставени с индикатора за бизнес климата в страната. На тези графики ясно се вижда, че спредовете на лихвените проценти по кредитите спрямо ЮРИБОР следват тенденция към понижаване в условията на наблюдаваната до края на 2008 г. силна икономическа активност, след което започват да нарастват в съответствие с отражението на глобалната икономическа криза върху стопанската конюнктура в страната и нейното влияние върху нивото на кредитния риск.

Списъкът с означенията и съответните дефиниции на променливите, които ще се използват за целите на анализа в изследването, са представени в таблица 1.

Таблица 1

**ОЗНАЧЕНИЯ НА ИЗПОЛЗВАНИТЕ ПРОМЕНЛИВИ**

| Означение | Дефиниция |
|---|---|
| $i_{LE}$ | Лихвен процент по кредитите за предприятия |
| $i_{LE\_BGN}$ | Лихвен процент по кредитите за предприятия в левове |
| $i_{LE\_EUR}$ | Лихвен процент по кредитите за предприятия в евро |
| $i_{LE\_ST}$ | Лихвен процент по кредитите за предприятия до 1 година |
| $i_{LE\_LT}$ | Лихвен процент по кредитите за предприятия над 1 година |
| $i_{LH}$ | Лихвен процент по кредитите за домакинства |
| $i_{LH\_BGN}$ | Лихвен процент по кредитите за домакинства в левове |
| $i_{LH\_EUR}$ | Лихвен процент по кредитите за домакинства в евро |
| euribor | Тримесечен ЮРИБОР |
| bc | Съставен индикатор за бизнес климата |

Наличието на сезонност в индикатора за бизнес климата наложи по отношение на него да бъде приложено сезонно изглаждане. Тъй като в динамичните редове за лихвените проценти не беше установена сезонност, по-нататък в анализа са използвани изходните данни за тези променливи.

## Иконометричен анализ

### *Тестове за единичен корен, коинтеграция и слаба екзогенност*

Преди да се пристъпи към моделирането на лихвените проценти по кредитите, най-напред е необходимо да се определи степента на интегрираност на разглежданите променливи. В таблица 2 са представени резултатите от *Augmented Dickey–Fuller* (*ADF*) теста за единичен корен, откъдето се вижда, че всички разглеждани серии са интегрирани от първи ред. Нулевата хипотеза за наличие на единичен корен не може да бъде отхвърлена за нивата на променливите, но се отхвърля при прилагането на *ADF* теста спрямо първите им разлики.

За да се провери устойчивостта на тези изводи, беше приложен и тест за единичен корен, в който нулевата хипотеза предполага стационарност на изследваната променлива. В таблица 3 са представени резултатите от *Kwiatkowski–Phillips–Schmidt–Shin* (*KPSS*) тест за стационарност. Като цяло *KPSS* тестът

потвърждава заключенията относно степента на интегрираност на променливите, като единственото изключение е показателят за бизнес климата (според *KPSS* теста тази променлива е стационарна).

Таблица 2

**ADF ТЕСТ ЗА ЕДИНИЧЕН КОРЕН**

| Променлива | Нива | | Първи разлики | | | Степен на интеграция |
|---|---|---|---|---|---|---|
| | Лагове | *ADF* статистика | Лагове | *ADF* статистика | | |
| $i_{LE}$ | 1 | -1.71 | 0 | -11.77 | *** | I(1) |
| $i_{LE\_BGN}$ | 0 | -2.50 | 0 | -12.34 | *** | I(1) |
| $i_{LE\_EUR}$ | 2 | -1.16 | 1 | -8.21 | *** | I(1) |
| $i_{LE\_ST}$ | 2 | -1.92 | 1 | -8.79 | *** | I(1) |
| $i_{LE\_LT}$ | 1 | -2.04 | 0 | -11.41 | *** | I(1) |
| $i_{LH}$ | 0 | -1.16 | 0 | -6.12 | *** | I(1) |
| $i_{LH\_BGN}$ | 0 | -0.93 | 0 | -6.15 | *** | I(1) |
| $i_{LH\_EUR}$ | 0 | -1.24 | 2 | -5.80 | *** | I(1) |
| euribor | 1 | -1.85 | 0 | -4.03 | *** | I(1) |
| bc | 1 | -2.16 | 0 | -4.61 | *** | I(1) |

**Бележки:** Нулевата хипотеза е за наличие на единичен корен.

Знаците ***/**/* означават отхвърляне на нулевата хипотеза при ниво на значимост съответно 1%, 5% и 10%. Спецификацията не включва константа или тренд. Броят на лаговете е избран на базата на *Schwarz Info Crirterion*.

Таблица 3

**KPSS ТЕСТ ЗА ЕДИНИЧЕН КОРЕН**

| Променлива | *LM* статистика | | Степен на интеграция |
|---|---|---|---|
| | Нива | Първи разлики | |
| $i_{LE}$ | 0.65** | 0.18 | I(1) |
| $i_{LE\_BGN}$ | 0.72** | 0.21 | I(1) |
| $i_{LE\_EUR}$ | 0.41* | 0.16 | I(1) |
| $i_{LE\_ST}$ | 0.66** | 0.18 | I(1) |
| $i_{LE\_LT}$ | 0.72** | 0.20 | I(1) |
| $i_{LH}$ | 0.76*** | 0.16 | I(1) |
| $i_{LH\_BGN}$ | 0.70** | 0.12 | I(1) |
| $i_{LH\_EUR}$ | 0.55** | 0.12 | I(1) |
| euribor | 0.50** | 0.09 | I(1) |
| bc | 0.19 | 0.17 | I(0) |

**Бележки:** Нулевата хипотеза е, че съответната променлива е стационарна.

Знаците***/**/* означават отхвърляне на нулевата хипотеза при ниво на значимост съответно 1%, 5% и 10%.

В общия случай прилагането на регресионен анализ по отношение на нестационарни променливи е свързано с опасността да бъдат направени изводи, базирани на привидни зависимости между променливите (*spurious regressions*). Един от вариантите за решаването на този проблем е оригиналните данни да се трансформират в стационарни серии, което се постига посредством изчисляването на разлики. Когато тестовете за единичен корен показват, че разглежданите серии не са стационарни, най-добрият подход обаче е първо да се провери дали те са коинтегрирани, т.е. дали съществува линейна комбинация между тях, която е стационарна. В този случай анализът може да се проведе в рамките на модел с корекция на грешката, използването на който позволява да бъдат направени изводи както за дългосрочната връзка между разглежданите променливи, така и за краткосрочната им динамика.

В настоящото изследване наличието на коинтеграция е проверено посредством процедурата на *Johansen*. Докато при теста за коинтеграция на *Engle* и *Granger* се допуска съществуването само на един коинтеграционен вектор, при нея е възможно да се провери и за наличието на повече от една дългосрочна зависимост между променливите. Другата основна разлика е, че процедурата на *Johansen* обхваща не едно, а система от уравнения, като всяка една от променливите се разглежда като ендогенна.

Таблица 4

***JOHANSEN* ТЕСТ ЗА КОИНТЕГРАЦИЯ МЕЖДУ ЛИХВЕНИЯ ПРОЦЕНТ ПО СЪОТВЕТНИЯ ВИД КРЕДИТИ, ЮРИБОР И ИНДИКАТОРА ЗА БИЗНЕС КЛИМАТА**

| Лихвен процент | Trace test | | | Max eigenvalue test | | |
|---|---|---|---|---|---|---|
| | r = 0 | r ≤ 1 | r ≤ 2 | r = 0 | r ≤ 1 | r ≤ 2 |
| $i_{LE}$ | 26.9 | 7.0 | 2.0 | 19.9* | 4.9 | 2.0 |
| $i_{LE\_BGN}$ | 31.5** | 7.2 | 1.1 | 24.3** | 6.2 | 1.1 |
| $i_{LE\_EUR}$ | 38.3*** | 8.3 | 4.1** | 30.0*** | 4.2 | 4.1** |
| $i_{LE\_ST}$ | 26.9 | 7.5 | 2.4 | 19.4* | 5.1 | 2.4 |
| $i_{LE\_LT}$ | 27.4* | 6.5 | 2.1 | 21.0* | 4.4 | 2.1 |
| $i_{LH}$ | 35.9*** | 5.6 | 0.8 | 30.3*** | 4.8 | 0.8 |
| $i_{LH\_BGN}$ | 33.1** | 5.6 | 0.7 | 27.5*** | 4.9 | 0.7 |
| $i_{LH\_EUR}$ | 38.5*** | 10.2 | 3.1* | 28.3*** | 7.1 | 3.1* |

**Бележка:** Знаците ***/**/* означават отхвърляне на нулевата хипотеза за наличие на съответния брой коинтеграционни уравнения ***r*** при ниво на значимост съответно 1%, 5% и 10%.

Таблица 4 съдържа резултатите от *Johansen* теста за коинтеграция между лихвения процент по съответния вид кредити, ЮРИБОР и индикатора за бизнес климата. Представени са стойностите на двете статистики, които се изчисляват в рамките на този тест за коинтеграция, а именно т.нар. проследяваща статистика (*trace statistics*) и статистиката на максималната собствена стойност (*maximal eigenvalue statistics*). Тези критерии показват, че хипотезата за липса на коинтеграционни уравнения (**r = 0**) се отхвърля в полза на извода за наличие на една коинтеграционна връзка между променливите.

Както беше споменато, тестът на *Johansen* за коинтеграция използва системен подход, т.е. разглежда система от уравнения. При него краткосрочната динамика на всяка от променливите се влияе както от краткосрочните изменения в останалите променливи, така и от отклоненията от съществуващата между тях дългосрочна връзка. Това означава, че в настоящото изследване пълният вид на системата би включвал уравнения за лихвения процент по съответния вид кредити, ЮРИБОР и индикатора за бизнес климата. Ако обаче се докаже, че последните две променливи са слабо екзогенни, т.е. че краткосрочната им динамика не се влияе от отклоненията от дългосрочната връзка, това означава, че системата би могла да бъде сведена до модел с корекция на грешката, състоящ се само от едно уравнение (това за лихвените проценти по кредитите). За да се установи дали ЮРИБОР и индикаторът за бизнес климата са слабо екзогенни, е необходимо да се провери хипотезата, че участващите в описващите ги уравнения коефициенти за обратна връзка пред отклонението от дългосрочната зависимост са статистически незначими. Резултатите показват, че едновременното допускане за слаба екзогенност на ЮРИБОР и на индикатора за бизнес климата не може да бъде отхвърлено, като изключение прави само моделът, в който лихвеният процент се отнася за левовите кредити за предприятия.

Таблица 5

**ТЕСТ ЗА СЛАБА ЕКЗОГЕННОСТ НА ЮРИБОР И ИНДИКАТОРА ЗА БИЗНЕС КЛИМАТА**

| Лихвен процент в контеграционното уравнение | LR test for binding restrictions | |
|---|---|---|
| | Chi-square | Probability |
| $i_{LE}$ | 1.69 | 0.4289 |
| $i_{LE\_BGN}$ | 6.06 | 0.0484 |
| $i_{LE\_EUR}$ | 4.21 | 0.1217 |
| $i_{LE\_ST}$ | 2.65 | 0.2656 |
| $i_{LE\_LT}$ | 1.98 | 0.3718 |
| $i_{LH}$ | 1.78 | 0.4114 |
| $i_{LH\_BGN}$ | 2.12 | 0.3470 |
| $i_{LH\_EUR}$ | 0.16 | 0.9247 |

**Бележка:** В последната колона на таблицата е посочена вероятността за погрешно отхвърляне на нулевата хипотеза за слаба екзогенност на ЮРИБОР и индикатора за бизнес климата.

## *Дългосрочна зависимост*

След като резултатите от тестовете за единичен корен, коинтеграция и слаба екзогенност показаха, че лихвените проценти по кредитите могат да бъдат моделирани в рамките на модел с корекция на грешката, който съдържа едно уравнение, тази част от изследването има за цел да анализира дългосрочната зависимост между разглежданите променливи. Според коинтеграционните уравнения за лихвените проценти по различните видове кредити цената на заемните ресурси в дългосрочен план е функция на тримесечния ЮРИБОР и на показателя за бизнес климата:

$$\mathbf{i_t = c + \beta euribor_t + \gamma bc_t + u_t} \quad (13),$$

където **i** е лихвеният процент по кредитите, **euribor** – тримесечният ЮРИБОР, а **bc** – индикаторът за бизнес климата. Особен интерес представлява коефициентът β, който отразява дългосрочната реакция на съответния лихвен процент по кредитите към промяна в ЮРИБОР. Например, ако **β = 1**, това означава, че е налице пълно пренасяне на промените в лихвеното ниво на паричния пазар в еврозоната върху лихвения процент по кредитите. Стойности под единица говорят съответно за частична реакция спрямо измененията в лихвеното ниво по междубанковите депозити в еврозоната.

Таблица 6

**ДЪЛГОСРОЧНА ЗАВИСИМОСТ В МОДЕЛИТЕ С ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ С РАЗЛИЧНА СЕКТОРНА ПРИНАДЛЕЖНОСТ НА ДЛЪЖНИЦИТЕ**

| | | Модел с $i_{LE}$ | Модел с $i_{LH}$ |
|---|---|---|---|
| const | coef. | 9.39*** | 12.78*** |
| | t-stat. | 40.8 | 15.9 |
| euribor | coef. | 0.97*** | 1.48*** |
| | t-stat. | 13.8 | 6.0 |
| bc | coef. | -0.12*** | -0.20*** |
| | t-stat. | -12.8 | -6.5 |
| Adjusted R-squared | | 0.86 | 0.59 |
| F-statistic | | 170.1 | 42.7 |
| Prob (F-statistic) | | 0.0000 | 0.0000 |
| Wald test β = 1 | F-statistic | 0.17 | 3.73 |
| | Prob. | 0.6856 | 0.0587 |
| | Chi-square | 0.17 | 3.73 |
| | Prob. | 0.6840 | 0.0536 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West*.

Таблица 7

**ДЪЛГОСРОЧНА ЗАВИСИМОСТ В МОДЕЛИТЕ С ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ ЗА ПРЕДПРИЯТИЯ С РАЗЛИЧЕН МАТУРИТЕТ**

| | | Модел с $i_{LE\_ST}$ | Модел с $i_{LE\_LT}$ |
|---|---|---|---|
| const | coef. | 8.22*** | 9.86*** |
| | t-stat. | 26.4 | 27.6 |
| euribor | coef. | 1.19*** | 1.07*** |
| | t-stat. | 12.9 | 9.6 |
| bc | coef. | -0.12*** | -0.14*** |
| | t-stat. | -9.3 | -8.9 |
| Adjusted R-squared | | 0.81 | 0.77 |
| F-statistic | | 125.9 | 94.3 |
| Prob (F-statistic) | | 0.0000 | 0.0000 |
| Wald test β = 1 | F-statistic | 4.18 | 0.42 |
| | Prob. | 0.0456 | 0.5178 |
| | Chi-square | 4.18 | 0.42 |
| | Prob. | 0.0408 | 0.5151 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West*.

Таблица 8

**ДЪЛГОСРОЧНА ЗАВИСИМОСТ В МОДЕЛИТЕ С ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ С РАЗЛИЧНА ВАЛУТНА ДЕНОМИНАЦИЯ**

| | | Модел | | | |
|---|---|---|---|---|---|
| | | $ci_{LE\_BGN}$ | $ci_{LE\_EUR}$ | $ci_{LH\_BGN}$ | $ci_{LH\_EUR}$ |
| const | coef. | 9.72*** | 8.77*** | 13.66*** | 10.57*** |
| | t-stat. | 29.1 | 38.4 | 21.5 | 14.4 |
| euribor | coef. | 1.02*** | 0.71*** | 1.29*** | 1.14*** |
| | t-stat. | 8.4 | 6.6 | 6.0 | 3.3 |
| bc | coef. | -0.11*** | -0.08*** | -0.20*** | -0.15*** |
| | t-stat. | -6.6 | -6.0 | -7.4 | -3.3 |
| Adjusted R-squared | | 0.78 | 0.65 | 0.64 | 0.39 |
| F-statistic | | 102.4 | 54.8 | 50.7 | 17.7 |
| Prob (F-statistic) | | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Wald test β = 1 | F-statistic | 0.02 | 7.41 | 1.78 | 0.16 |
| | Prob. | 0.8891 | 0.0087 | 0.1879 | 0.6866 |
| | Chi-square | 0.02 | 7.41 | 1.78 | 0.16 |
| | Prob. | 0.8886 | 0.0065 | 0.1824 | 0.6849 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West*.

В таблици 6, 7 и 8 са представени дългосрочните връзки в моделите с лихвените проценти по различните видове кредити, като в качеството на критерии за разграничението са използвани съответно секторната принадлежност на длъжниците (предприятия или домакинства), матуритетът на кредитите за предприятия (до една или над една година) и валутната деноминация на кредитите (левове или евро). Резултатите от всички модели дават основание да се направи заключението, че в дългосрочен план лихвените проценти по кредитите се определят от динамиката на цената на междубанковите депозити в еврозоната и от състоянието на стопанската конюнктура. Коефициентите на тези променливи са статистически значими и имат очакваните знаци. Повишението на ЮРИБОР води до покачване цената на заемните ресурси в страната, а отрицателният знак на коефициента пред индикатора за бизнес климата се дължи на факта, че подобряването на стопанската конюнктура е свързано с повишаване кредитоспособността на длъжниците и съответно със свиване на изискваната от банките премия за кредитен риск.

Интерес представлява въпросът, дали лихвените проценти по отделните видове кредити се характеризират с различна по степен чувствителност към посочените фактори. Резултатите показват, че реакцията спрямо промените в стопанската конюнктура е сходна при лихвените проценти по отделните видове кредити, но съществуват разлики по отношение на тяхната чувствителност спрямо измененията в лихвеното ниво по междубанковите депозити в еврозоната.

Точковата оценка на коефициента пред ЮРИБОР в модела с лихвения процент по кредитите за предприятия е 0.97, като според теста на *Wald* хипотезата, че коефициентът е равен на единица, не може да бъде отхвърлена. При кредитите за домакинства чувствителността на лихвения процент спрямо ЮРИБОР е много по-силна: покачване на неговото ниво с един процентен пункт е свързано с повишаване цената на заемните ресурси с 1.48 процентни пункта, а резултатът от теста на *Wald* отхвърля хипотезата, че този коефициент е равен на единица. Силната чувствителност спрямо ЮРИБОР на лихвения процент по кредитите за домакинства може да се интерпретира като следствие от факта, че търсенето на кредити от страна на домакинствата се характеризира с по-ниска ценова еластичност в сравнение с корпоративния сектор. За разлика от предприятията, домакинствата не разполагат с широк кръг алтернативни източници на финансиране, което стои в основата и на по-ниската еластичност, с която се отличава тяхното търсене на кредити.

Различия се наблюдават и по отношение на матуритета на кредитите за предприятия. Въпреки че точковите оценки на коефициента пред ЮРИБОР са близки при двата вида кредити (1.19 при краткосрочните спрямо 1.07 при кредитите за предприятия с матуритет над една година), резултатите от теста на *Wald* отхвърлят хипотезата, че този коефициент е равен на единица само при краткосрочните кредити за предприятия.

Чувствителността спрямо ЮРИБОР на лихвените проценти по кредитите се различава от гледна точка на валутната деноминация на заемните ресурси. Стойността на коефициента пред ЮРИБОР при левовите кредити е по-висока от съответната стойност при кредитите в евро, като този извод е в сила както при домакинствата, така и при предприятията. Според резултатите от теста на *Wald* коефициентът пред ЮРИБОР при левовите кредити за предприятия е статистически неразличим

от единица, докато при кредитите за корпоративния сектор в евро неговата стойност е значително по-ниска. Този резултат произтича от по-високата ценова еластичност на търсенето на банкови кредити в евро от страна на корпоративния сектор, която на свой ред е следствие от наличието на алтернативни форми на финансиране на дейността в лицето на привличането на средства от нерезиденти. Въпреки че в сектора на домакинствата точковите оценки на коефициента пред ЮРИБОР са по-високи от единица както при левовите, така и при кредитите в евро, резултатите от теста на *Wald* показват, че тези разлики не са статистически значими.

### *Модели с корекция на грешката*

Както е известно, при моделите с корекция на грешката динамиката на зависимата променлива се определя както от краткосрочната динамика на разглежданите фактори, така и от съществуващото през предходния период отклонение на зависимата променлива от равновесното равнище, зададено от дългосрочната зависимост. На базата на оценената коинтеграционна връзка между лихвените проценти по кредитите, цената на ресурса на междубанковия пазар в еврозоната и индикатора за бизнес климата в страната, в тази част на изследването са предложени две спецификации на модел с корекция на грешката. Първата спецификация е стандартна и има вида:

$$\Delta \mathbf{i}_t = \mathbf{c} + \alpha \mathbf{ECT}_{t-1} + \sum^{\mathbf{p}}_{j=0} \delta_{t-j} \Delta \mathbf{euribor}_{t-j} + \sum^{\mathbf{q}}_{k=0} \phi_{t-k} \Delta \mathbf{bc}_{t-k} + \sum^{\mathbf{s}}_{l=1} \mu_{t-l} \Delta \mathbf{i}_{t-l} + \varepsilon_t \quad (14),$$

където $\mathbf{ECT}_t = \mathbf{i}_t - \beta \mathbf{euribor}_t - \gamma \mathbf{bc}_t$ и $\mathbf{i}_t$ е лихвеният процент по кредитите, **euribor** е тримесечният ЮРИБОР, а **bc** е индикаторът за бизнес климата.

Другата спецификация предвижда наличието на асиметрия в реакцията на лихвените проценти по кредитите, която се проявява в два аспекта. Първо, в нея се допуска придвижването към дългосрочното равновесие да се осъществява с различна скорост в зависимост от това, дали лихвеният процент по кредитите се намира над или под равновесното равнище, зададено от дългосрочната зависимост между променливите. Второ, в тази спецификация се допуска наличието на асиметрия и в непосредствената реакция спрямо промените в ЮРИБОР, като при нея се оценяват отделни коефициенти по отношение на промените във възходяща и в низходяща посока. Асиметричният модел с корекция на грешката може да бъде представен по следния начин:

$$\Delta \mathbf{i}_t = \mathbf{c} + \alpha^+ \mathbf{I}_t \mathbf{ECT}_{t-1} + \alpha^- (\mathbf{1} - \mathbf{I}_t) \mathbf{ECT}_{t-1} + \sum^{\mathbf{p}}_{\mathbf{j=0}} \delta^+_{\mathbf{t-j}} \mathbf{G}_t \Delta \mathbf{euribor}_{\mathbf{t-j}} + \sum^{\mathbf{p}}_{\mathbf{j=0}} \delta^-_{\mathbf{t-j}} (\mathbf{1} - \mathbf{G}_t) \Delta \mathbf{euribor}_{\mathbf{t-j}} + \sum^{\mathbf{q}}_{\mathbf{k=0}} \phi_{\mathbf{t-k}} \Delta \mathbf{bc}_{\mathbf{t-k}} + \sum^{\mathbf{s}}_{\mathbf{l=1}} \mu_{\mathbf{t-l}} \Delta \mathbf{i}_{\mathbf{t-l}} + \varepsilon_t \quad (15),$$

където

$$\mathbf{I}_t = \begin{cases} \mathbf{1}, \text{ако } \mathbf{ECT}_{t-1} > \mathbf{0} \\ \mathbf{0}, \text{ако } \mathbf{ECT}_{t-1} \leq \mathbf{0} \end{cases}$$

и

$$\mathbf{G}_t = \begin{cases} \mathbf{1}, \text{ако } \Delta \mathbf{euribor}_t > \mathbf{0} \\ \mathbf{0}, \text{ако } \Delta \mathbf{euribor}_t \leq \mathbf{0} \end{cases}$$

При оценяването на стандартния и на асиметричния модел с корекция на грешката първоначално беше използвана по-обща лагова структура, след което от спецификацията бяха изключени лаговете, които са незначими в моделите за всеки от видовете кредити. В окончателния си вид спецификацията разглежда реакцията на лихвените проценти по кредитите спрямо отклоненията от дългосрочната връзка между променливите, настъпилите през текущия период изменения в ЮРИБОР и в бизнес климата, както и регистрираните през изминалия период промени в съответния лихвен процент по кредитите.

Таблица 9

**БАЗИСНИ МОДЕЛИ С КОРЕКЦИЯ НА ГРЕШКАТА ЗА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ С РАЗЛИЧНА СЕКТОРНА ПРИНАДЛЕЖНОСТ НА ДЛЪЖНИЦИТЕ**

| | | Модел с $i_{LE}$ | Модел с $i_{LH}$ |
|---|---|---|---|
| const | coef. | -0.07 | -0.15** |
| | t-stat. | -1.4 | -2.3 |
| $ECT_{t-1}$ | coef. | -0.43*** | -0.10*** |
| | t-stat. | -4.0 | -4.5 |
| $\Delta$ $euribor_t$ | coef. | 0.58*** | -0.25* |
| | t-stat. | 4.4 | -1.7 |
| $\Delta$ $bc_t$ | coef. | -0.06*** | 0.00 |
| | t-stat. | -4.1 | 0.1 |
| $\Delta$ $i_{t-1}$ | coef. | -0.35*** | -0.02 |
| | t-stat. | -5.2 | -0.2 |
| Adjusted R-squared | | 0.45 | 0.25 |
| F-statistic | | 12.17 | 5.52 |
| Prob (F-statistic) | | 0.0000 | 0.0009 |
| Durbin-Watson stat | | 2.32 | 2.11 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West*.

Таблица 10

**БАЗИСНИ МОДЕЛИ С КОРЕКЦИЯ НА ГРЕШКАТА ЗА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ ЗА ПРЕДПРИЯТИЯ С РАЗЛИЧЕН МАТУРИТЕТ**

| | | Модел с $i_{LE\_ST}$ | Модел с $i_{LE\_LT}$ |
|---|---|---|---|
| const | coef. | -0.06 | -0.13* |
| | t-stat. | -0.7 | -1.8 |
| $ECT_{t-1}$ | coef. | -0.47*** | -0.42*** |
| | t-stat. | -4.1 | -3.3 |
| $\Delta$ $euribor_t$ | coef. | 0.96*** | 0.28 |
| | t-stat. | 4.7 | 1.2 |
| $\Delta$ $bc_t$ | coef. | -0.05** | -0.05** |
| | t-stat. | -2.5 | -2.3 |
| $\Delta$ $i_{t-1}$ | coef. | -0.24** | -0.32*** |
| | t-stat. | -2.5 | -4.1 |
| Adjusted R-squared | | 0.39 | 0.38 |
| F-statistic | | 9.92 | 9.38 |
| Prob (F-statistic) | | 0.0000 | 0.0000 |
| Durbin-Watson stat | | 2.07 | 2.16 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West*.

Таблица 11

**БАЗИСНИ МОДЕЛИ С КОРЕКЦИЯ НА ГРЕШКАТА ЗА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ С РАЗЛИЧНА ВАЛУТНА ДЕНОМИНАЦИЯ**

| | | Модел | | | |
|---|---|---|---|---|---|
| | | $ci_{LE\_BGN}$ | $ci_{LE\_EUR}$ | $ci_{LH\_BGN}$ | $ci_{LH\_EUR}$ |
| const | coef. | -0.12* | 0.03 | -0.13 | -0.08 |
| | t-stat. | -1.7 | 0.3 | -1.6 | -0.6 |
| $ECT_{t-1}$ | coef. | -0.37*** | -0.54*** | -0.11*** | -0.24** |
| | t-stat. | -4.3 | -4.1 | -4.0 | -2.6 |
| $\Delta$ $euribor_t$ | coef. | 0.44*** | 0.41* | -0.18 | -0.34 |
| | t-stat. | 3.6 | 2.0 | -1.0 | -1.3 |
| $\Delta$ $bc_t$ | coef. | -0.08*** | -0.04 | -0.01 | 0.00 |
| | t-stat. | -4.0 | -1.6 | -0.3 | -0.2 |
| $\Delta$ $i_{t-1}$ | coef. | -0.38*** | -0.09 | 0.04 | -0.26*** |
| | t-stat. | -3.1 | -0.9 | 0.3 | -3.5 |
| Adjusted R-squared | | 0.41 | 0.33 | 0.15 | 0.22 |
| F-statistic | | 10.57 | 7.91 | 3.46 | 4.57 |
| Prob (F-statistic) | | 0.0000 | 0.0000 | 0.0142 | 0.0034 |
| Durbin-Watson stat | | 2.28 | 2.10 | 2.06 | 1.99 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на Newey-West.

В таблици 9, 10 и 11 са представени резултатите от оценката на стандартен модел с корекция на грешката за лихвените проценти по различните видове кредити. В качеството на критерии за разграничение са използвани съответно секторната принадлежност на длъжниците (предприятия или домакинства), матуритетът на кредитите за предприятия (до една или над една година) и валутната деноминация на кредитите (левове или евро).

Резултатите показват, че придвижването към дългосрочното равновесие влияе върху краткосрочната динамика на лихвените проценти по всички видове кредити, като скоростта, с която то се осъществява, варира според вида кредит. При лихвените проценти по кредитите за предприятия частта от отклонението от дългосрочната връзка, което се коригира през следващия период, е в размер на 43% спрямо 10% при кредитите

за домакинства. Скоростта на възстановяване на дългосрочната връзка при лихвените проценти по кредити до една година е сходна с тази при кредитите с по-дълъг матуритет, като и в двата случая над 40% от отклонението се възстановяват през следващия период. Динамиката на лихвените проценти по кредити в евро се характеризира с по-бързо възстановяване на дългосрочното равновесие в сравнение със заемните ресурси в левове, като този извод е в сила както за корпоративния сектор, така и за домакинствата. При кредитите за предприятия частта от отклонението от дългосрочната връзка, което се коригира през следващия период, е в размер на 54% за кредитите в евро спрямо 37% за левовите кредити, а при лихвените проценти по заемните средства за домакинства съответните стойности са 24% при кредитите в евро и 11% при левовите кредити.

Лихвените проценти по отделните видове кредити се характеризират и с различна реакция по отношение на краткосрочните изменения в ЮРИБОР. При лихвените проценти по кредитите за предприятия тази реакция е сравнително силна, като 58% от размера на настъпилите в текущия период промени в ЮРИБОР се пренасят веднага върху лихвеното ниво по корпоративните кредити. При кредитите за домакинства коефициентът има обратен на очаквания знак, но се характеризира с много ниска статистическа значимост. Докато степента на непосредствена реакция към промяна в ЮРИБОР не зависи от валутната деноминация на кредитите, налице са значителни различия от гледна точка на техния матуритет. При кредитите със срок до една година покачване на ЮРИБОР с един процентен пункт води до незабавно повишение в цената на заемните ресурси в почти същия размер, докато при кредитите с матуритет над една година коефициентът на реакция спрямо настъпилото в текущия период изменение на ЮРИБОР не е статистически значим. Накрая, въпреки че в дългосрочен план промените в бизнес климата са фактор за динамиката на лихвените проценти по всички видове кредити, с незабавна реакция спрямо тях се характеризират само кредитите за предприятия. Промените в бизнес климата не водят до незабавни изменения в лихвените проценти по кредитите за домакинства.

Таблица 12

**АСИМЕТРИЧНИ МОДЕЛИ С КОРЕКЦИЯ НА ГРЕШКАТА ЗА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ С РАЗЛИЧНА СЕКТОРНА ПРИНАДЛЕЖНОСТ НА ДЛЪЖНИЦИТЕ**

| | | Модел | |
|---|---|---|---|
| | | c $i_{LE}$ | c $i_{LH}$ |
| const | coef. | -0.05 | -0.31*** |
| | t-stat. | -0.6 | -3.3 |
| $ECT^{+}_{t-1}$ | coef. | -0.56** | -0.03 |
| | t-stat. | -2.6 | -1.0 |
| $ECT^{-}_{t-1}$ | coef. | -0.26 | -0.18*** |
| | t-stat. | -1.3 | -3.0 |
| $\Delta^{+}$ euribor$_t$ | coef. | 0.84* | 0.02 |
| | t-stat. | 1.8 | 0.1 |
| $\Delta^{-}$ euribor$_t$ | coef. | 0.45** | -0.28 |
| | t-stat. | 2.2 | -1.2 |
| $\Delta$ bc$_t$ | coef. | -0.06*** | 0.00 |
| | t-stat. | -2.7 | 0.1 |
| $\Delta$ i $_{t-1}$ | coef. | -0.37*** | 0.00 |
| | t-stat. | -4.3 | 0.0 |
| Adjusted R-squared | | 0.43 | 0.25 |
| F-statistic | | 8.03 | 4.10 |
| Prob (F-statistic) | | 0.0000 | 0.0021 |
| Durbin-Watson stat | | 2.34 | 2.19 |
| Wald test coef. ($ECT^{+}_{t-1}$) = coef. ($ECT^{-}_{t-1}$) | F-statistic | 0.6 | 3.1 |
| | Prob. | 0.4246 | 0.0849 |
| | Chi-square | 0.6 | 3.1 |
| | Prob. | 0.4207 | 0.0787 |
| Wald test coef. ($\Delta^{+}$ euribor$_t$) = coef. ($\Delta^{-}$ euribor$_t$) | F-statistic | 0.4 | 0.7 |
| | Prob. | 0.5301 | 0.4058 |
| | Chi-square | 0.4 | 0.7 |
| | Prob. | 0.5272 | 0.4018 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West*.

Таблица 13

**АСИМЕТРИЧНИ МОДЕЛИ С КОРЕКЦИЯ НА ГРЕШКАТА ЗА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ ЗА ПРЕДПРИЯТИЯ С РАЗЛИЧЕН МАТУРИТЕТ**

| | | Модел | |
|---|---|---|---|
| | | c $i_{LE\_ST}$ | c $i_{LE\_LT}$ |
| const | coef. | 0.08 | 0.02 |
| | t-stat. | 0.5 | 0.1 |
| $ECT^{+}_{t-1}$ | coef. | -0.78*** | -0.48* |
| | t-stat. | -2.9 | -1.8 |
| $ECT^{-}_{t-1}$ | coef. | -0.23 | -0.43* |
| | t-stat. | -1.2 | -2.0 |
| $\Delta^{+}$ euribor$_t$ | coef. | 1.10* | -0.35 |
| | t-stat. | 1.9 | -0.5 |
| $\Delta^{-}$ euribor$_t$ | coef. | 0.95** | 0.58*** |
| | t-stat. | 2.4 | 2.7 |
| $\Delta$ bc$_t$ | coef. | -0.04* | -0.06*** |
| | t-stat. | -1.8 | -2.8 |
| $\Delta$ i $_{t-1}$ | coef. | -0.23** | -0.28*** |
| | t-stat. | -2.3 | -2.9 |
| Adjusted R-squared | | 0.39 | 0.38 |
| F-statistic | | 6.83 | 6.60 |
| Prob (F-statistic) | | 0.0000 | 0.0000 |
| Durbin-Watson stat | | 2.00 | 2.13 |
| Wald test coef. ($ECT^{+}_{t-1}$) = coef. ($ECT^{-}_{t-1}$) | F-statistic | 1.9 | 0.0 |
| | Prob. | 0.1701 | 0.9028 |
| | Chi-square | 1.9 | 0.0 |
| | Prob. | 0.1638 | 0.9022 |
| Wald test coef. ($\Delta^{+}$ euribor$_t$) = coef. ($\Delta^{-}$ euribor$_t$) | F-statistic | 0.0 | 1.3 |
| | Prob. | 0.8605 | 0.2635 |
| | Chi-square | 0.0 | 1.3 |
| | Prob. | 0.8598 | 0.2580 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West.*

Таблица 14

## АСИМЕТРИЧНИ МОДЕЛИ С КОРЕКЦИЯ НА ГРЕШКАТА ЗА ЛИХВЕНИТЕ ПРОЦЕНТИ ПО КРЕДИТИТЕ С РАЗЛИЧНА ВАЛУТНА ДЕНОМИНАЦИЯ

| | | Модел с $i_{LE\_BGN}$ | Модел с $i_{LE\_EUR}$ | Модел с $i_{LH\_BGN}$ | Модел с $i_{LH\_EUR}$ |
|---|---|---|---|---|---|
| const | coef. | -0.22** | 0.11 | -0.29*** | -0.52** |
| | t-stat. | -2.2 | 0.6 | -3.0 | -2.5 |
| $ECT^{+}_{t-1}$ | coef. | -0.29 | -0.73*** | -0.03 | 0.00 |
| | t-stat. | -1.7 | -3.9 | -0.8 | 0.0 |
| $ECT^{-}_{t-1}$ | coef. | -0.43** | -0.36 | -0.20** | -0.72* |
| | t-stat. | -2.6 | -1.1 | -2.6 | -1.8 |
| $\Delta^{+}$ euribor$_t$ | coef. | 0.73** | 0.40 | 0.08 | -1.26 |
| | t-stat. | 2.0 | 0.6 | 0.3 | -0.9 |
| $\Delta^{-}$ euribor$_t$ | coef. | 0.28 | 0.35 | -0.23 | 0.02 |
| | t-stat. | 1.2 | 1.4 | -0.8 | 0.1 |
| $\Delta$ bc$_t$ | coef. | -0.07*** | -0.03 | -0.01 | -0.02 |
| | t-stat. | -3.4 | -1.1 | -0.4 | -1.2 |
| $\Delta$ i $_{t-1}$ | coef. | -0.38*** | -0.06 | 0.06 | -0.23** |
| | t-stat. | -2.7 | -0.6 | 0.4 | -2.4 |
| Adjusted R-squared | | 0.40 | 0.32 | 0.15 | 0.32 |
| F-statistic | | 7.05 | 5.27 | 2.61 | 4.96 |
| Prob (F-statistic) | | 0.0000 | 0.0003 | 0.0282 | 0.0006 |
| Durbin-Watson stat | | 2.23 | 2.11 | 2.15 | 2.07 |
| Wald test coef. ($ECT^{+}_{t-1}$) = coef. ($ECT^{-}_{t-1}$) | F-statistic | 0.2 | 0.6 | 2.5 | 2.3 |
| | Prob. | 0.6363 | 0.4458 | 0.1189 | 0.1355 |
| | Chi-square | 0.2 | 0.6 | 2.5 | 2.3 |
| | Prob. | 0.6342 | 0.4421 | 0.1124 | 0.1285 |
| Wald test coef. ($\Delta^{+}$ euribor$_t$) = coef. ($\Delta^{-}$ euribor$_t$) | F-statistic | 0.8 | 0.0 | 0.6 | 0.5 |
| | Prob. | 0.3904 | 0.9458 | 0.4416 | 0.4679 |
| | Chi-square | 0.8 | 0.0 | 0.6 | 0.5 |
| | Prob. | 0.3862 | 0.9455 | 0.4379 | 0.4641 |

**Бележки:** Със знаците ***/**/* е означена статистическа значимост при 1%, 5% и 10%. t-статистиките са базирани на стандартни грешки, изчислени по метода на *Newey-West*.

Таблици 12–14 представят резултатите от оценката на приложения по отношение на различните видове кредити асиметричен модел с корекция на грешката. На база точковите оценки на коефициентите биха могли да се направят два предварителни извода. Първо, при лихвените проценти по корпоративни кредити придвижването към дългосрочното равновесие е по-бързо, когато корекцията е в низходяща посока, докато при кредитите за домакинства скоростта е по-голяма при корекция в посока повишение. Второ, при лихвените проценти по заемните средства за домакинства непосредствената реакция спрямо измененията в ЮРИБОР не е статистически значима независимо от посоката на тези изменения, докато лихвените проценти по кредитите за предприятия реагират по-силно при повишение на ЮРИБОР, отколкото при неговото намаление. Формална проверка за наличието на асиметрия обаче би могла да се направи с използването на *Wald* тест за равенство на коефициентите, описващи съответно реакциите във възходяща и в низходяща посока. Според резултатите от теста на *Wald* асиметрия в непосредствената реакция към изменение на ЮРИБОР не може да бъде установена, тъй като нулевата хипотеза, че коефициентът на незабавна реакция към повишение на ЮРИБОР е равен по размер на този при неговото понижение, не се отхвърля за лихвените проценти по нито един от всички видове кредити. По отношение на въпроса за евентуални разлики в скоростта, с която дългосрочното равновесие се възстановява, когато лихвените проценти по кредитите се намират над, съответно под равновесната стойност, наличие на асиметрия също не се установява. Фактът, че скоростта на изменение във възходяща посока не е по-висока от тази при понижение на лихвените проценти по кредитите, може да се интерпретира като свидетелство за силната конкурентна среда, с която се характеризира банковата система в България.

## Заключение

При моделирането на лихвените проценти по кредитите централна роля се отделя на тяхната реакция спрямо промени в лихвените нива по инструментите на централната банка или в цената на ресурсите на паричния пазар (т.нар. *interest rate pass-through*). Както показва прегледът на литературата, този процес стои в основата на теоретичните модели за формирането на банковите лихвени проценти и служи като рамка при техния емпиричен анализ. Една от задачите на настоящото изследване е този анализ да бъде приложен по отношение на лихвените проценти по банковите кредити в България, като за целта стандартните подходи при изучаването на връзката им с монетарните условия са адаптирани към характеристиките на местната среда. Първата особеност е свързана с избора на индикатора за монетарните условия, спрямо измененията в който се измерва реакцията на лихвените проценти по кредитите. Докато при страните със самостоятелна парична политика обект на изследване са степента и скоростта, с които промените в лихвените нива по инструментите на централната банка или лихвения процент на паричния пазар се пренасят върху банковите лихвени проценти, при паричен съвет актуалният въпрос е, как и в каква степен монетарните условия в страната (зоната) на резервната валута намират отражение върху лихвените проценти по кредитите в местната банкова система. По тази причина вместо реакцията към измененията в лихвения процент на паричния пазар предмет на анализ е степента и скоростта, с които лихвените равнища по различните видове кредити в България се адаптират към промените в цената на ресурсите на паричния пазар в еврозоната. Втората особеност е, че за разлика от повечето изследвания в тази област, тук наред с монетарните условия е отчетена ролята и на кредитния риск като фактор при формиране цената на заемните ресурси. Този въпрос заслужава внимание с оглед значителните промени в икономическата конюнктура през последните години и започналото през 2008 г. отражение на глобалната финансова криза върху българската икономика. Влиянието на кредитния риск е отчетено индиректно – посредством третирането на съставния индикатор за бизнес климата като фактор за динамиката на лихвените проценти по кредитите. В основата на това стои допускането, че по-благоприятната стопанска конюнктура създава условия за по-добра кредитоспособност на длъжниците, намалява

кредитния риск в икономиката и в крайна сметка води до понижение на изискваната от банките рискова премия в цената на заемните ресурси.

Една от задачите на изследването е да моделира лихвените проценти по кредитите в рамките на модели с корекция на грешката, с което да се направи разграничение между краткосрочна и дългосрочна реакция спрямо измененията в обуславящите ги фактори. Наред с базовата е предложена и алтернативна спецификация, чиято цел е да провери дали реакцията на лихвените проценти по кредитите се характеризира с асиметрия в зависимост от посоката на промените в лихвеното ниво на паричния пазар в еврозоната, както и дали придвижването на лихвените проценти по кредитите към дългосрочното им равновесие се осъществява с различна скорост в зависимост от знака на съответното отклонение. Анализът е проведен по отношение на различни лихвени проценти от гледна точка на секторна принадлежност на кредитополучателите, валутна деноминация и матуритет на кредитите, като са идентифицирани разликите между обособените според тези критерии видове кредити.

Резултатите от дескриптивния анализ и иконометричната оценка на всички модели дават основание да се направи заключението, че в дългосрочен план лихвените проценти по кредитите се определят от динамиката на цената на междубанковите депозити в еврозоната и от състоянието на стопанската конюнктура. Повишението на ЮРИБОР води до покачване цената на заемните ресурси в страната, а подобряването на бизнес климата е свързано с повишаване на кредитоспособността на длъжниците и съответно със свиване на изискваната от банките премия за кредитен риск. Интерес представлява въпросът, дали лихвените проценти по отделните видове кредити се характеризират с различна степен на чувствителност към посочените фактори. Резултатите показват, че реакцията спрямо промените в стопанската конюнктура е сходна при лихвените проценти по отделните видове кредити, но съществуват различия по отношение на тяхната чувствителност спрямо измененията в лихвеното ниво по междубанковите депозити в еврозоната. Силната чувствителност на лихвения процент по кредитите за домакинства спрямо ЮРИБОР може да се интерпретира като следствие от факта, че търсенето на кредити от страна на

домакинствата се характеризира с по-ниска ценова еластичност в сравнение с корпоративния сектор (за разлика от предприятията домакинствата не разполагат с широк кръг алтернативни източници на финансиране, което стои в основата и на по-ниската еластичност, с която се отличава тяхното търсене на кредити). Чувствителността спрямо ЮРИБОР на лихвените проценти по кредитите се различава и от гледна точка на валутната деноминация на заемните ресурси. Този резултат произтича от по-високата ценова еластичност на търсенето на банкови кредити в евро от страна на корпоративния сектор, която на свой ред е следствие от наличието на алтернативни форми за финансиране на дейността в лицето на привлечените средства от нерезиденти.

Приложеният по отношение на различните видове кредити асиметричен модел с корекция на грешката показва, че асиметрия в непосредствената реакция спрямо изменение на ЮРИБОР не може да бъде установена, тъй като нулевата хипотеза, че коефициентът на незабавна реакция към повишение на ЮРИБОР е равен по размер на този при неговото понижение, не се отхвърля за лихвените проценти по нито един от всички видове кредити. По отношение на въпроса за евентуални разлики в скоростта, с която дългосрочното равновесие се възстановява, когато лихвените проценти по кредитите се намират над, съответно под равновесната стойност, наличие на асиметрия също не се установява Фактът, че скоростта на изменение във възходяща посока не е по-висока от тази при понижение на лихвените проценти по кредитите, може да се интерпретира като свидетелство за силната конкурентна среда, с която се характеризира банковата система в България.

Резултатите от изследването дават възможност да се направят допълнителни изводи с практическа насоченост, които могат да бъдат от полза за текущата законодателна практика, отнасяща се до регулацията на отношенията на банките с техните клиенти. Например, в момента протича активен обществен дебат относно практиките на формиране на лихвените проценти по кредитите и необходимостта те да бъдат привързани към независими пазарни индикатори. През януари 2014 г. в парламента бяха внесени предложения за промени в Закона за потребителския кредит, като мотив за които беше посочена необходимостта от по-голяма прозрачност при формирането на лихвените проценти по кредитите. Според направените предложения при договорите

за кредит с променлив лихвен процент цената на кредита трябва да се определя като сума от фиксирана надбавка над референтен лихвен процент, дефиниран като „пазарно определян индекс ЛИБОР, ЮРИБОР, СОФИБОР или комбинация от тях и/или индикатори, публикувани от БНБ и Националния статистически институт". Получените от изследването резултати дават основание да се направи извод, че ценовата политика на банките и в момента е съобразена с пазарните и макроикономическите тенденции, поради което приемането на предложените законодателни промени може да се отрази единствено на информираността на клиентите на банките, но не и да предизвика съществени промени в механизма, по който се определят лихвените проценти по кредитите. Важно е да се отбележи, че регулирането на ценовата политика на банките не трябва да ограничава тяхната способност да реагират гъвкаво на присъщите на банковата дейност рискове, тъй като в противен случай това може да засегне не само кредитните институции, но и техните клиенти.

В заключение, от гледна точка на оперативната дейност по макроикономическо моделиране и анализ и поддържането на финансовата стабилност резултатите от изследването могат да бъдат използвани в две насоки. Познаването на степента и скоростта, с които монетарните импулси от паричната политика на ЕЦБ се отразяват върху лихвените проценти по продуктите на местния банков сектор, може да послужи при анализа на влиянието на външната среда върху българската икономика и формирането на очакванията за бъдещите стойности на макроикономическите индикатори. Наред с това резултатите биха могли да бъдат от полза и за анализа на финансовата стабилност, по-конкретно формирането на очакванията за динамиката на кредитния риск и оценката на адекватността на буферите в банковата система.

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