MODELING INTEREST RATE TRANSMISSION DYNAMICS IN GREECE. IS THERE ANY STRUCTURAL BREAK AFTER EMU?

By DIONYSIOS P. CHIONIS * AND COSTAS A. LEON **

Abstract

We examine the transmission process of the policy rate to the lending and deposit rates in Greece for the period 1996-2004 within bivariate cointegration and error correction framework. A significant structural break takes place with the accession of Greece into EMU in 2001. The bank rates become much more responsive to the policy rate in terms of impact multipliers and speed of convergence to the equilibrium, a consequence of the common monetary policy. However, the process is still not complete even after the accession into the EMU.

JEL classification: E52, E43.
Author Keywords: interest rate pass-through, monetary policy, transmission dynamics, Greece.

* Corresponding Author: Democritus University of Thrace, Greece. Department of International Economics and Development. Email: chionis@ierd.duth.gr.
** Democritus University of Thrace, Greece. Department of International Economics and Development. Email: kleon@ierd.duth.gr.

1. Introduction

The European Monetary Union (EMU) is understood as an area with common monetary and exchange rate policy aiming at common economic objectives, such as liberalization of capital and labor movements, monetary and financial integration and elimination of the fluctuations of exchange rates of the participating member states. For the time being, and still under the gradual integration process, the convergence of the interest rates in the EMU makes many authors to believe that asymmetries in the monetary policy shocks will tend to disappear.

Across to this framework an interesting question is how shocks of the policy-controlled interest rate are propagated in the deposit and lending rates. This propagation / transmission is a part of the transmission mechanism of monetary policy. Monetary transmission mechanism is a core issue in modern macroeconomics because it helps understanding the interaction between the real and the monetary sector of the economy. Its main question is how a change in a nominal variable, e.g. the interest rate, is translated into changes in output, prices and employment. We may identify two fundamental stages in this mechanism. In the first stage the reaction function, i.e. the function that determines the short run policy-controlled interest rate, is derived under optimization conditions given the optimal growth and inflation mix. Given the determination of this policy rate, we now ask how the changes in this rate are propagated in the rest interest rates. The process is usually called in the economic literature pass-through of interest rates or interest rate transmission. In the second stage we ask how the changes in these interest rates are translated into changes in output, prices and employment. This second stage is described by means of the channels of monetary policy. Here we focus on the first stage, and, in particular, on the transmission from the policy-controlled interest rate to the retail rates.

Various studies referring to European countries have been concerned with the transmission from the policy-controlled interest rate to the retail rates, see, *inter alia*, Mojon (2000), Sander and Kleimeier (2000, 2001, 2004), Angeloni and Ehrman (2003), Toolsema *et al* (2001), Burgstaller (2003), Bredin *et al* (2001), Petursson (2001), De Bondt (2003). From these studies one can realize the following: stickiness in the transmission process, non-completeness at least in some cases, significant variations across countries and indications of convergence after the introduction of the single currency on 1/1/1999 and the creation of the EMU.

In this paper we continue the above line of research in the interest rate transmission dynamics and focus, in particular, on Greece. We ask how the shocks of the policy-controlled interest rate are transmitted to deposit and lending rates in Greece during the last eight years. Greece has been a participating member since 2001 and its monetary policy is conducted in line with the ECB targets. Therefore, an interesting question is whether there has been a structural break after the EMU (by this we mean the period after the accession of Greece to EMU in 1/1/2001) in comparison to the pre-EMU period. To our knowledge, the propagation mechanism from the policy rate to the lending and deposit rates and the issue of a possible structural break after the EMU in Greece have not been dealt with. For example, the study by Mylonidis and Nikolaidou (2001) is referring to the testing of expectation hypothesis of the term structure of interest rates with Greek money market data up to October 2001, but no reference is made to the propagation of the policy rates to the lending or deposit rates.

In this paper we make use of the most recent available data, up to September 2004, and we address the following questions:

What is the impact multiplier in lending and deposit rates before and after EMU? Is the process completed and how long does it take for completion? Is there any structural break in the transmission dynamics after the accession of Greece into EMU?

In brief, our findings are that a completely new situation is coming into view after the EMU: the impact multipliers are now active and the speed of convergence to the new equilibria is very fast. However, the transmission is not complete. If our null hypothesis is that there is no structural break after the EMU, this clearly cannot be maintained on the basis of our statistical findings.

The paper is organized as follows: In Section 2 we present a summary of findings in the literature. In Section 3 we describe the data and the statistical framework to be employed. Section 4 discusses the transmission in the lending and deposit interest rates. The paper concludes in Section 5.

2. Studies on the Transmission Dynamics of Interest Rates

A common element found by all researchers is the stickiness of the interest rates. Stickiness simply means that a change in the policy interest rate, controlled by the Central Bank, is not propagated immediately to the retail rates (lending and deposit). Thus, these retail rates respond later, and in some cases, to a lesser degree than the initial impulse on the policy interest rate. In these cases the process is characterized as incomplete. Three issues have been the subject of theoretical and empirical research on the interest rate transmission, (Toolsema *et al*, 2001). First, the theoretical explanation on the interest rate stickiness. Agency costs due to asymmetric information (adverse selection and moral hazard), (Stiglitz and Weiss, 1981), adjustment costs (Cottarelli and Kourelis, 1994), switching costs (Klemperer, 1987) and risk sharing (Fried and Howitt, 1980) are the four theoretical contributions to the interest rate stickiness. Second, the degree of stickiness across countries. Cottarelli and Kourelis (1994) show a significant difference in the degree in both impact and long run multipliers across EMU countries. A similar view is obtained from the studies of Borio and Fritz (1995), Kleimeier and Sander (2000), Donnay and Degryse (2001) and Toolsema *et al* (2001). Further, issues of asymmetric propagation seem to arise, depending on whether there is a positive or negative impulse on the policy rate (see, *inter alia,* De Bondt, 2002; Borio and Fritz, 1995; Mojon, 2000) or whether the rates are below or above their equilibrium level (Hofmann, 2000; Kleimeier and Sander, 2000). Third, the relationship between interest rate stickiness and the financial system. Despite of the adoption of the common currency in the EMU area, significant differences still exist across EMU countries in their financial system (Mojon, 2000). These differences may be attributed to heavy investments in brand names which are country specific, networks of branches and different marketing policies, (Gual, 1999), and different setting and legal expertise (Cecchetti, 1999).

Although different statistical methodologies have been applied, involving different data sets, countries, time periods and underlying assumptions, most authors seem to agree on the following results, see, *inter alia*, Burgstaller, 2003. First, a high degree on stickiness of retail lending rates. For example, in the EMU area, only 30% of the change on a given market rate is passed to the lending rates within a month. Second, strong empirical evidence for significant differences among EMU area. Third, the average full adjustment of the retail rates to market rates varies between 3 and 10 months (De Bondt, 2002). Fourth, the final pass-through of market retail rates is typically complete or, in some cases (Cottarelli and Kourelis, 1994) even more than complete, reaching 110% and the speed at which the market rates are completely transmitted to retail rates can vary between 3 months and 2 years.

3. Data Set, Statistical Methodology and Some Preliminary Tests

The data set comprises of three interest rates series, called policy, lending and deposit rates. The lending rate concerns short run loans to enterprises and the deposit rates concern deposits from households. Both rates are of one year maturity. We use monthly data covering the period July 1996 up to September 2004, that is, 99 observations in total. This period has been chosen for two reasons. First, it is this period when money market starts to function and becomes important in Greece, and, second, interest rates prior to this period were principally administered by the Central Bank and show no variation for long periods. Thus, statistical estimates from series without variation would not be meaningful. An important issue arising here is which of the various interest rates that the Central Bank identifies as instruments will be used as a proxy for the policy rate. We have selected the money market rate to be used as the policy rate since this rate is the one which is more strongly correlated with monetary policy as a whole (Donnay and Degryse, 2001). The policy-controlled interest rates we examine here intend to cover refinancing operations of one and three months. The rates are expressed on annual basis. Preliminary experimentation (not shown in this research) of these two money market rates (of one and three months), with the lending and deposit rates, shows that it is the rate of one month which possesses slightly better properties in terms of statistical adequacy. Therefore, we have chosen the interest rate of one month as our policy rate. More on the sources of data is given in the Appendix.

The paper employs bivariate cointegration methods and the associated Error Correction Model (ECM) for the estimation of parameters. A theoretically possible alternative would be to employ the Johansen's cointegration framework. However, given the bivariate nature of our examined relationship, Johansen's procedure would reveal at most one cointegrating vector, which is also the case within our proposed single-equation framework, described below. If the bank rate (lending or deposit) forms a linear long run relationship with the policy rate, a possible structure is the following equilibrium model

$$BR_t = \theta_0 + \theta_1 M_t + \varepsilon_t .$$

Short run dynamic adjustments (assuming one lag) are possible with the following disequilibrium model

$$BR_t = \gamma_0 + \gamma_1 M_t + \gamma_2 M_{t-1} + \gamma_3 BR_{t-1} + \xi_t .$$

However, due to non-stationarity frequently encountered in the applied research, an estimable model in the analysis of interest rate dynamics is in the error correction form. This is known in the literature as the Granger Representation Theorem (Granger, 1987). This estimable form is the Error Correction Model (ECM), which is a reparameterization of the disequilibrium model taking into account the long run model. In particular, in a dynamic setting governed by possible non-stationarity and provided that cointegration exists, the ECM avoids the issue of spurious regression, ensures orthogonality among regressor, and allows parameters estimation in a statistically valid fashion. Our ECM has the form

$$\Delta BR_t = \delta + \gamma_1 \Delta M_t + (\gamma_1 + \gamma_2) M_{t-1} - (1 - \gamma_3) BR_{t-1} + u_t ,$$

where BR_t is the bank rate (lending or deposit) and M_t is the policy rate. θ_0 and θ_1 are long run parameters to be estimated from the equilibrium model. Δ is the difference operator and $\delta, \gamma_1, \gamma_2, \gamma_3$ are short run parameters to be estimated. The parameter γ_1 is the impact multiplier. The long run parameters, estimated from the ECM and denoted as θ'_0 and θ'_1, are computed as $\frac{\delta}{1-\gamma_3}$ and $\frac{\gamma_1 + \gamma_2}{1-\gamma_3}$, respectively. In all these models we assume that the stochastic perturbations ε_t, ξ_t and u_t are i.i.d. processes. Given these assumptions, the estimates from the ECM are consistent and asymptotically efficient.

If the transmission process is complete then the long run parameter equals 1, that is, $\theta_1 = 1$, or $\theta'_1 = 1$, and all the change in the policy rate will be transmitted to the bank rate, although, in practice, it will take some months for the process to be completed. If $\theta_1 < 1$ or $\theta'_1 < 1$, then the process is incomplete, i.e. not all the change in the policy rate is transmitted to the bank rate. Finally, if $\theta_1 > 1$ or $\theta'_1 > 1$, then the bank rate change is even higher than the policy rate change. We experimented with several model structures, within the class of the ECMs, with various ARMA components and dummy variables to account for the shift of the regime in January 2001. Our final estimates are given in Tables 2 – 6.

As it is customary in empirical analyses, we examine the dynamic properties of the employed interest rate series. We are interested if they are stationary or not, and if not, what their data generating processes are. Two means of analysis are employed: visual display of the series and their autocorrelation and partial autocorrelation functions, and formal unit root testing. Figures 1 and 2 show the graphs of the rates and their autocorrelation and partial autocorrelation functions. It is obvious from these graphs that the series appear to be non-stationary and downward trending. To establish the non-stationarity property of the series, we proceed to formal unit root testing, i.e. ADF (Dickey and Fuller, 1979) and PP (Phillips and Perron, 1988) tests with several combinations of constant, and constant with a trend. Since these tests are sensitive to the deterministic components (constant and trend) and the selected lag length, we used a variety of optimal length information criteria such as AIC (Akaike) and SIC (Schwartz). Our experimentation verifies the visual impression: all the series are indeed non-stationary governed by one unit root process, and in some cases with a drift. The message from the above is that all series are integrated of order one, a result consistent with previous findings and a necessary condition for cointegration in a bivariate context [1].

A next step in the analysis is to see if these series are cointegrated, that is, if the bank rate (lending or deposit) form a stable long run linear relationship with the policy controlled rate. It is only in this case that ECM provides statistically sound and economically interpretable parameters estimations. On the basis of cointegration test and the Granger critical values (Engle and Granger, 1987; Engle and Yoo, 1987, Table 3), and from the cointegrating Durbin Watson (CRDW) statistic, both shown on the Table 1, it turns out that our two regressions form a stable long run linear

[1] Unit Root Tests: The ADF t statistics (-2.87 for the policy rate M1, -1.56 for the lending rate LD and -1.66 for the deposit rate DP) are not significant at the conventional significance levels (5% and 10%). All the series are non stationary with one unit root. The AIC has been employed for the determination of the optimal lag length.

relationship, marginally, though, at 10% significance level. Therefore, we proceed to the ECM estimation. Tables 2 and 4, present the estimates of the ECM for both interest rates equations.

4. The Transmission Dynamics: Findings

The preceding statistical analysis leads to the following findings: We may identify two periods of interest rate dynamics: the period prior to EMU, 1996:07-2000:12 and the period 2001:01 – 2004:09, i.e. the period after the accession into EMU. In both periods there is a common property: the downward trend in all interest rates, although with very different speeds. Given the downward trends, a comparison of the interest rates between these two periods by means of simple averages would not be sensible. Instead, we prefer to fit a linear trend as an approximation of the downward movements of the interest rates. These regressions show that the downward trend is fast in the period prior to EMU, while in the second, it is clearly of much lower speed, almost of zero speed. For example, the lending rate downward trend was -0.22 percentage units per month before the EMU and just -0.02 after the EMU. For the deposit rates the figures are -0.10 and -0.04, respectively. The very low speeds in the second period, for both retail rates, imply a sort of convergence, a finding in accordance with the European integration literature. Table 7, shows the estimates of the trends.

Further, both lending and deposit rates seem to form a long run relationship with the money market policy rate, marginally, though, at 10% significance level. This is established on both the cointegrating Durbin Watson and the cointegration ADF test.

The interest rate of one month is correlated somewhat more strongly with both retail rates than the rate of three months does.

The statistical fitness of the ECMs for the whole period 1996:07 – 2004:09 is not particularly strong, especially for the lending rate. The R^2 for lending rate equation is weak, just 0.16, while for the deposit rate R^2 is 0.44. However, given that, in general, the fitness of the ECMs is not particularly high, 0.44 is considered satisfactory. To find a more precise indication of the fitness of the model for the two periods under consideration, we performed two separate regressions (not shown), instead of including dummies. We found that for both retail rates, the first period is characterized by very low R^2 s, less than 0.10 in both cases, while, in contrary, in the second period R^2 s are very satisfactory (0.70 for the lending rate and 0.77 for the deposit rate). A possible reason for this is that during the first period the transmission from the policy rate to the lending rate is quite noisy, reflecting low effectiveness of the policy rate as a means to influence the retail rates. The inclusion of dummy variables in the ECM equations (0 for the period before EMU and 1 after the EMU) improves the statistical adequacy of the model and reveals a structural break in the estimated parameters. This, of course, reflects the regime shift due to the accession of Greece in the EMU and the adoption of the ECB monetary policy guides since 2001:01. The change in impact multiplier, γ_1, is obvious. For the lending rate, the impact multiplier before EMU is 0.09, very low indeed, while after the EMU γ_1 rises to 0.508. The same picture is emerged for the deposit rates. Before EMU, γ_1 is 0.063, while after EMU it rises to 0.64. These are, in fact, very significant changes for both retail rates. Tables 2-6 present estimates and diagnostics of the estimated models. The estimates of the short run parameters are presented in Tables 2 and 4. The high volatility of the interest rates in the prior to EMU period and the associated low fitness are shown in Figure 3. Diagnostics for the ECMs are presented in Table 6. No autocorrelation or ARCH effects are statistically significant at 5% s.l. However, the normality assumption of the residuals, on the basis of the Jarque-Berra statistics, is clearly rejected, probably due to non linearity frequently met in transition processes, see Figure 4. The stability of the coefficients is evaluated by the Cusum of Squares Test, shown on Figure 5. No parameters instability is apparent for both ECMs on the basis of the test.

For the long run multipliers we provide two different ways of estimation. The first is by means of the equilibrium model (the static, cointegrating regression) while the second is by means of the error correction model. We have denoted these two long run multipliers by θ_1 and θ'_1, respectively. For the lending rate before the EMU, for example, the long run multiplier obtained from the ECM is 1.86, while the same multiplier obtained from the static regression is 0.926. After the EMU, the figures are 0.52 and 0.78, respectively. For the deposit rate and before the EMU, the multipliers are 0.50 from the static regression and 1.24 from the ECM. For the period after the EMU, these multipliers are 0.63 and 0.68, respectively, in fact identical. We may ascribe these differences of the estimates from the two models in the noisy and non-effective transmission mechanism (reflected by low R^2 s) before the EMU. In the period after the EMU, the estimates from the two models are close, as it is expected from the econometric theory, given the consistency of the ECM estimates and the superconsistency of the cointegrating vector properties. Therefore, concluding that the process is more complete in the first period, due to higher long run multipliers, is rather misleading, due to low explanatory power of the models involved for this period. We think that direct comparison of the multipliers for both periods should be done cautiously. See Tables 1 and 5 for the estimates from the static regression, and Tables 2 and 4 for the estimates from the ECM.

The dynamic adjustments towards equilibrium are very different in the two periods. We perform a simulation on the assumption that a negative 100 basis points shock takes place. The simulation is conducted with the aid of the short run disequilibrium model whose parameters $\delta, \gamma_1, \gamma_2, \gamma_3$ have been obtained indirectly from the ECM, (Tables 2, 4). For example, for the lending rate, in the first period, we assume that the equilibrium policy rate is 11.4 (the average in the period) and due to the negative shock, the new equilibrium value of the lending rate, on the basis of the long run parameters θ'_0 and θ'_1 obtained indirectly from the ECM, will be 10.8. The dynamic adjustment from the initial value of 11.4 to the new value 10.8 will last about 70 periods, an extremely long period for the working of the monetary policy. This reflects the ineffectiveness of the monetary policy for the influence of the policy rate to the lending rate. For the lending rate again, the situation is completely different in the after EMU period. The speed of convergence is very fast. It should be emphasized, however, that the speed of convergence depends critically on the precision we wish to have. If, for example, we want a precision with two decimal points for our new equilibrium value, then the full convergence is, of course, of lower speed. We think, however, that a precision with one decimal point is satisfactory in practice. Given this assumption, the transmission is complete within 3 months. The same picture is emerged from the dynamic adjustment of the deposit rate. After the EMU, the convergence is instantaneous. Figure 6 shows the dynamic adjustments for the two interest rates before and after the EMU.

5. Conclusion

This paper studies the transmission process of interest rates in Greece, before and after the EMU, with monthly data from 1996:07 - 2004:09. As a policy rate we have chosen the one month interest rate. We study how the changes of the policy rate are propagated into the lending and deposit rates with maturity of one year. Our findings are consistent with the relevant literature, although not fully. Using a cointegration and error correction framework we find the following: First, downward trends are clear and fast before the EMU, while after the EMU downward trends are very slow, a consequence of the common monetary policy in the Eurozone area and an indication of convergence of the interest rates. Second, in the period before the EMU, and in common with all the relevant literature, the process is characterized by high stickiness, as measured by the impact multipliers, which in our data set is very low. The situation changes dramatically in the after the EMU period. Now the impact multipliers become indeed active. Third, as for the completion of the process, that is, the long run multipliers, the picture is not clear in the first period. In the second period, the estimates from the two models (ECM and the equilibrium model) are comparable for both interest rates. Here, still the process is not complete since the long run multiplier θ_1 is less than one, being 0.52 for the lending rate and 0.63 for the deposit rate. That is, 100 basis points change in the policy rate will change the equilibrium lending rate by 52 basis points and by 63 basis points the deposit rate. This finding of the non-completion of the transmission process differs from the findings of most of the papers in the literature. Finally, we think that structural break due to the accession in the EMU is clear from our empirical evidence, despite any model drawbacks of statistical nature for the first period. The implications of the structural break are important. Interest rate transmission now works and monetary policy has become an active tool since when the ECB is responsible for monetary policy. This is clearly the positive effect. On the negative side, the issue of the non-completion still remains since the benefits of the monetary policy do not fully arrive at the final target groups, the debtors and depositors. It is probable, however, that if the intra-EMU credit mobility could be accelerated, the transmission process could also be complete at some later time. Concluding the paper, some other issues may be addressed for future research. For example, the propagation of policy rates, beyond the two rates we studied here, to other series of retail interest rates or bond yields. Also, instead of the one or three month interest rate as an instrument of the monetary policy, other similar rates could be tried. Another extension would be the possible interaction between the various rates and the feedback to the policy rates, by means of VAR models. Or, probably, asymmetries during the business cycle or asymmetries with regard to the direction of the shock (i.e. positive or negative shock).

Appendix: Data Sources

The interest rate data set has been obtained from the Bulletin of Conjuctural Indicators, various issues, of the Bank of Greece. It is worth noting that several definitions and methods of computations have been applied to this data set over time, and, therefore, the same interest rate over different periods is not absolutely comparable.

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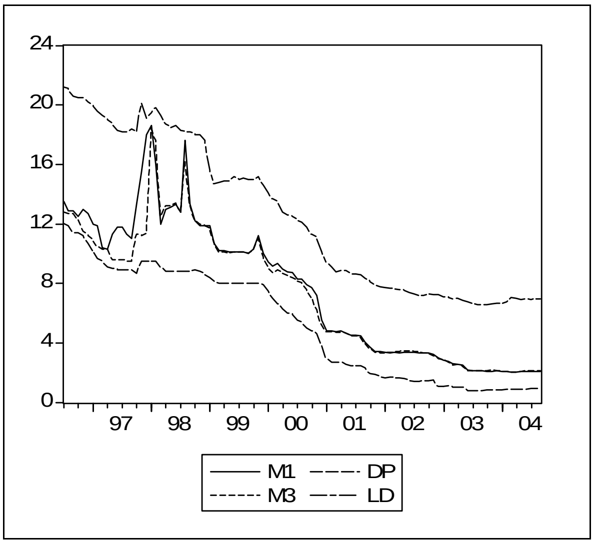
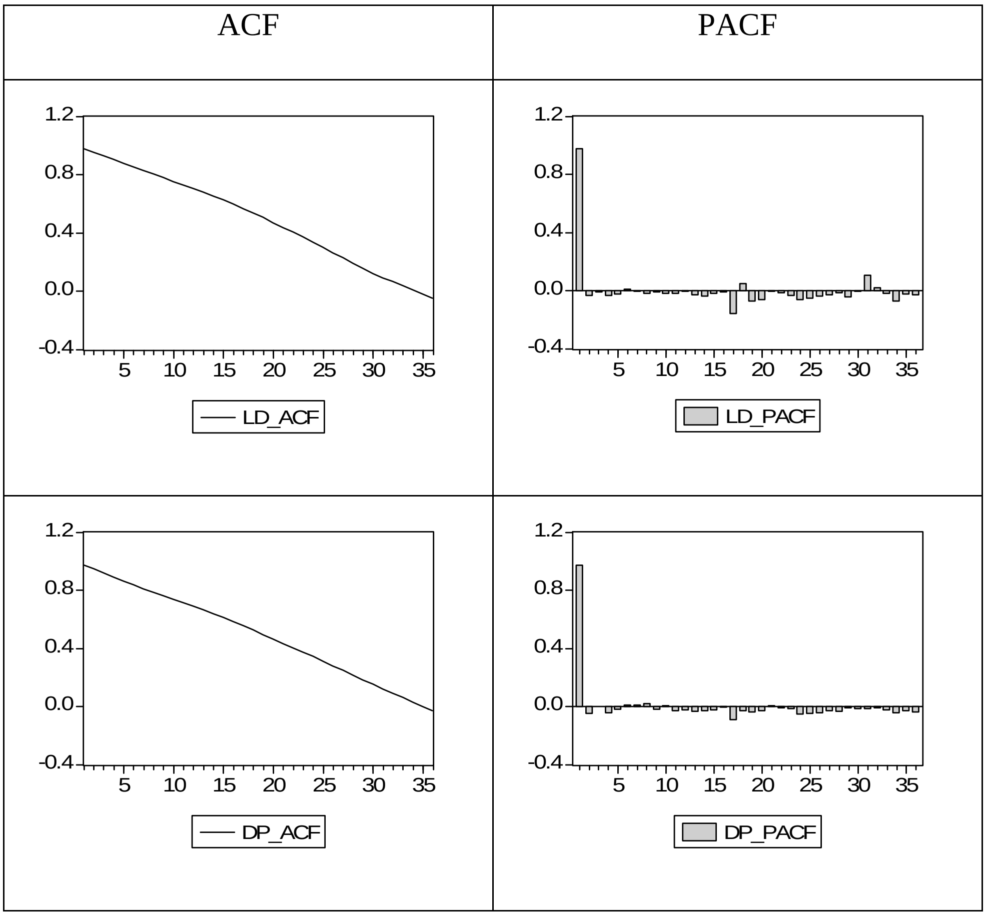
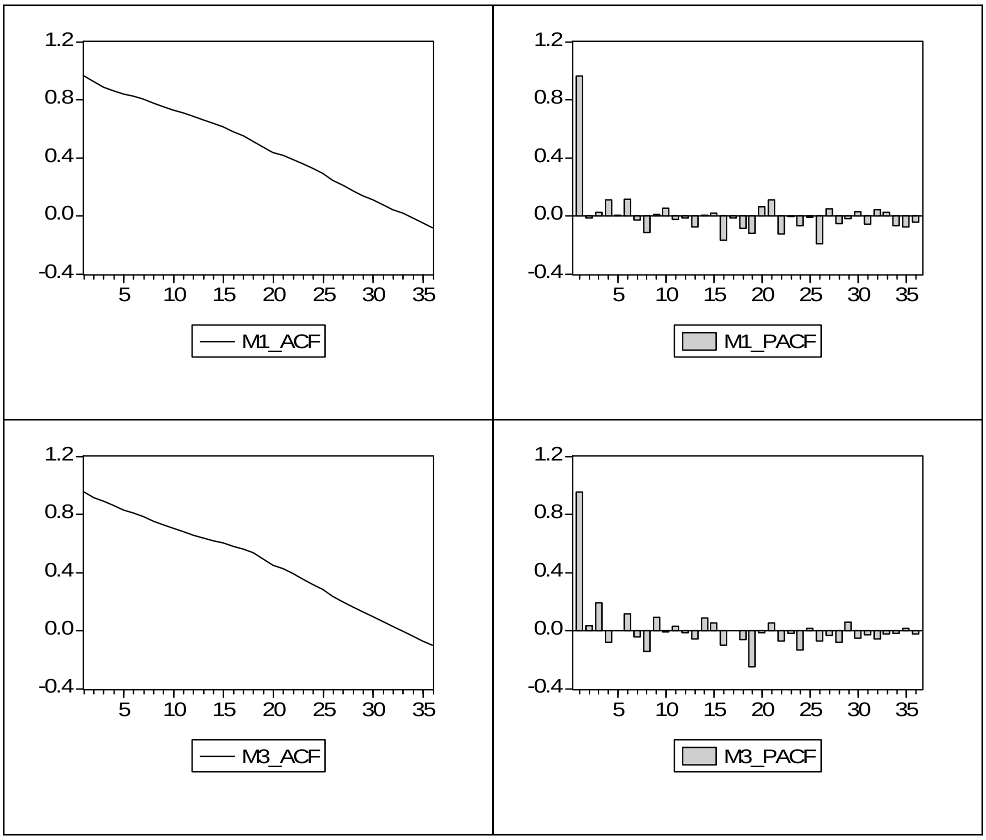
Fi**gure 1: Time Plot of Money Market and Retail Rates, 1996:07 – 2004:09**



Note: M1: policy rate of one month, M3: policy rate of three months (not used in the regression functions), LD: Lending rate, DP: Deposit rate.

Figure 2: Autocorrelation and Partial Autocorrelation Functions





Note: ACF: autocorrelation function. PACF: partial autocorrelation function. LD: Lending Rate, DP: Deposit Rate.

Figure 3: Actual and Fitted Values of the ECM

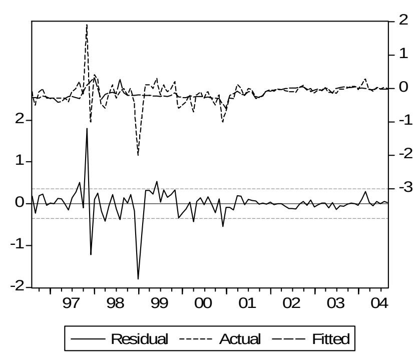
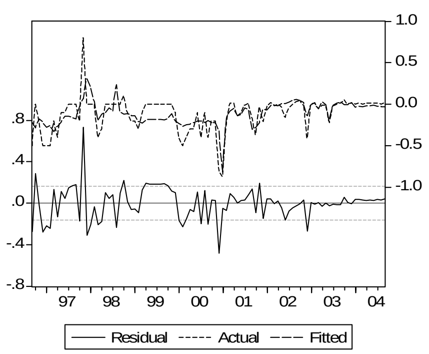
Lending Rate	Deposit Rate
	

Figure 4: Residuals Histograms

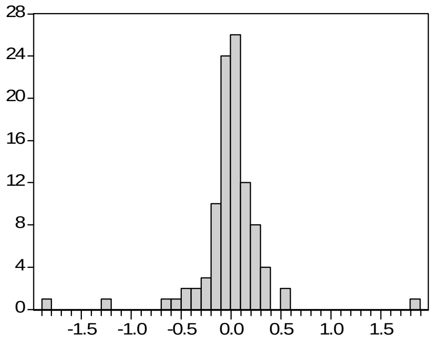
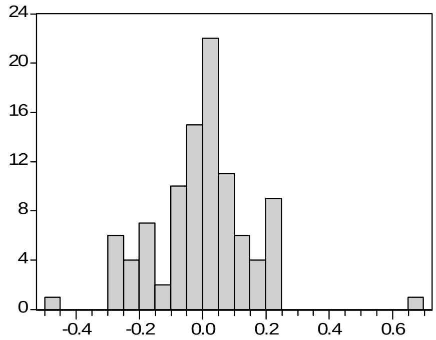
Lending Rate	Deposit Rate
	

Figure 5: Cusum of Squares Test

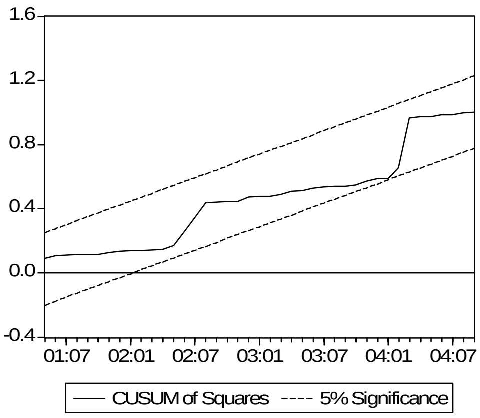
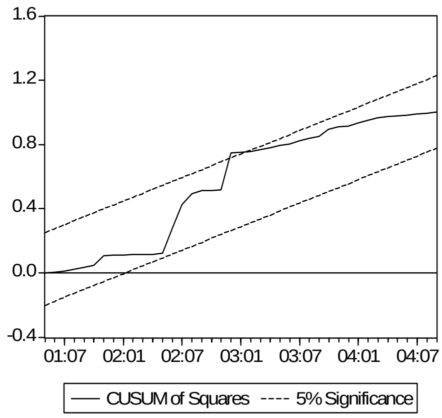
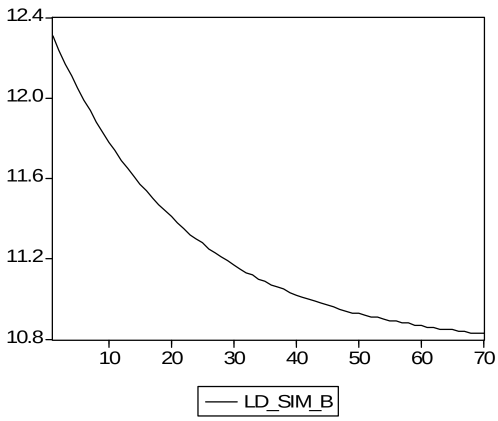
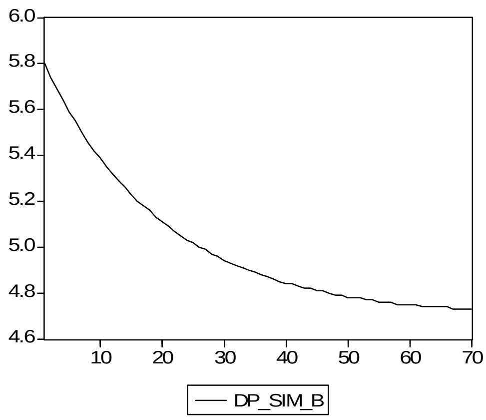
Lending Rate	Deposit Rate
	

Figure 6: Dynamic Adjustments to Equilibrium after a 100 bp Negative Shock

<table>
<tr><th>Lending Rate Adjustment Path</th><th>Deposit Rate Adjustment Path</th></tr>
<tr><td>Before</td><td>Before</td></tr>
<tr><td>
</td><td>
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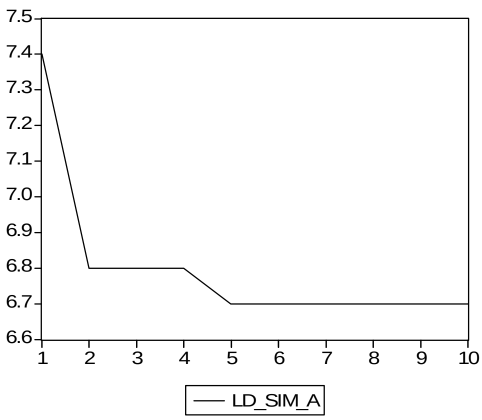
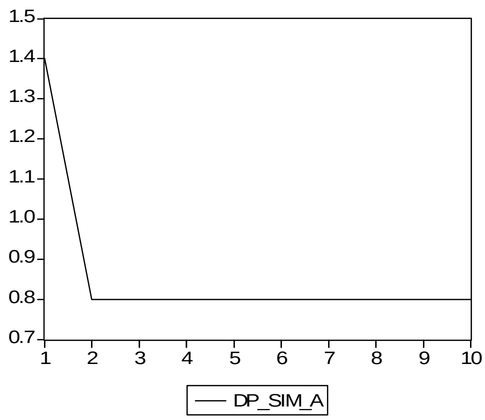
<tr><td>After</td><td>After</td></tr>
<tr><td>
</td><td>
</td></tr>
</table>

Note: LD_SIM_B: Lending Rate Adjustment Before EMU. DP_SIM_B: Deposit Rate Adjustment Before EMU. LD_SIM_A: Lending Rate Adjustment After EMU. DP_SIM_A: Deposit Rate Adjustment After EMU.

Table 1: Cointegration ADF Tests on the Residuals in the Static Regressions

Residuals from	t statistic	CRDW statistic	Unit Root Yes/No
LD regression	-3.938190	0.478090	No
DP regression	-3.704290	0.315726	No

Table 2: Lending Rate: Estimates from the ECM

Before EMU		After EMU	
S-R Parameters	**L-R Parameters**	**S-R Parameters**	**L-R Parameters**
$\delta = -0.40$ $\gamma_1 = 0.09$ $\gamma_2 = -0.006$ $\gamma_3 = 0.955$	$\theta'_0 = -8.89$ $\theta'_1 = 1.86$	$\delta = 0.989$ $\gamma_1 = 0.508$ $\gamma_2 = -0.417$ $\gamma_3 = 0.828$	$\theta'_0 = 5.75$ $\theta'_1 = 0.527$

Table 3: Lending Rate: Estimates from the Cointegrating Equation

L-R Parameters Before EMU	L-R Parameters After EMU
$\theta_0 = 6.128$ $\theta_1 = 0.926$	$\theta_0 = 5.010$ $\theta_1 = 0.780$

Table 4: Deposit Rate: Estimates from the ECM

Before EMU		After EMU	
S-R Parameters	**L-R Parameters**	**S-R Parameters**	**L-R Parameters**
$\delta = -0.41$ $\gamma_1 = 0.064$ $\gamma_2 = -0.002$ $\gamma_3 = 0.95$	$\theta'_0 = -8.34$ $\theta'_1 = 1.24$	$\delta = -0.187$ $\gamma_1 = 0.641$ $\gamma_2 = -0.407$ $\gamma_3 = 0.632$	$\theta'_0 = -0.50$ $\theta'_1 = 0.63$

Table 5: Deposit Rate: Estimates from the Cointegrating Equation

L-R Parameters Before EMU	L-R Parameters After EMU
$\theta_0 = 2.62$ $\theta_1 = 0.50$	$\theta_0 = -0.64$ $\theta_1 = 0.68$

Table 6: Diagnostics of the ECMs

Lending Rate Equation	Deposit Rate Equation
R^2 0.16	R^2 0.44
DW 2.1	DW 1.99
LM Serial Correlation (2 lags) F 0.134	LM Serial Correlation (2 lags) F 2.23
ARCH (2 lags) F 2.78	ARCH (2 lags) F 0.919
Jarque – Berra 869.74	Jarque – Berra 37.43

Table 7: Linear Trend Approximations: Estimates for λ

Regression Equation: $BR_t = \phi + \lambda t + h_t$

Lending Rate	Deposit Rate
Period 1996:07 – 2000:12: λ = -0.22	Period 1996:07 – 2000:12: λ =-0.10
Period 2001:01 – 2004:09: λ =-0.02	Period 2001:01 – 2004:09: λ = -0.04