



BULGARIAN NATIONAL BANK

**The Currency Board in Bulgaria:  
Design, Peculiarities and  
Management of Foreign  
Exchange Cover**

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Dobrislav Dobrev

August 1999

## DISCUSSION PAPERS

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**SUMMARY:** THE PAPER REVIEWS THE DESIGN OF THE CURRENCY BOARD ARRANGEMENT IN BULGARIA. A COMPARISON TO AN ORTHODOX CURRENCY BOARD IS MADE. THE MAIN TOOLS OF MONETARY POLICY OPERATIONS ARE EXAMINED TO CHECK CONSISTENCY WITH CURRENCY BOARD RULES. THE PROBLEMS THAT COULD ARISE FROM USING EXISTING POSSIBILITIES FOR SUCH OPERATIONS IN CONTRADICTION WITH THE OPERATING PRINCIPLES OF AN ORTHODOX CURRENCY BOARD ARE DISCUSSED. AN APPROPRIATE DIAGRAM OF THE MAIN FLOW CHANNELS AND BALANCE SHEETS IN THE FINANCIAL SYSTEM IS PRESENTED. THE MONEY SUPPLY PROCESS IS EXAMINED IN ORDER TO EXPLAIN THE MAIN PECULIARITIES IN THE DESIGN OF THE CURRENCY BOARD IN BULGARIA. A FUNDAMENTAL EQUATION EXPRESSING THE RELATIONSHIP BETWEEN THE FACTORS AFFECTING THE STABILITY OF THE CURRENCY BOARD IS DERIVED. THE ROLE OF RESERVE MANAGEMENT OPERATIONS IN THE FUNCTIONING OF THE CURRENCY BOARD IS ANALYZED.

**KEYWORDS:** Currency board, monetary policy, financial system, reserve management, risk management.

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*Views expressed in the paper are those of the author and do not necessarily reflect Bank policy.*

## I. Reasons to Introduce a Currency Board Arrangement in Bulgaria

The currency board arrangement (CBA) in Bulgaria was introduced after a short episode of hyperinflation in December 1996 – February 1997 when major stabilization policy efforts failed and key institutions lost their credibility. The following sequence of events highlights the picture of the Bulgarian economy during that period:

- the government used to fund deficits of bankrupt state enterprises by supplying subsidies;
- the central bank used to fund government deficits by printing Bulgarian levs;
- commercial banks used to fund deficits of bankrupt state enterprises by supplying loans;
- the central bank used to refinance commercial banks by extending discount loans;
- insolvent commercial banks triggered a severe banking crisis;
- the Bulgarian lev depreciated substantially against all major currencies;
- the economy was driven into a hyperinflationary spiral;
- several stabilization policy attempts failed and key institutions lost their credibility.

It became clear that one of the main reasons for the hard economic environment was the lack of financial discipline due to noncompliance with contemporary laws and regulations. The government, in general being ready to fund bankruptcy through the politicized central bank, created a typical moral hazard problem for all economic agents.

Thus, the idea to introduce a **rule-based** instead of a **discretionary** mechanism of money supply regulation originated in a rather natural way as an ultimate measure to restore financial system credibility and revive the economy. The CBA in Bulgaria was assumed not only as a pure stabilization device but also as a tool to impose financial discipline and market-driven commercial culture upon all economic agents (Avramov, 1999, pp. 7 – 8).

A more detailed survey on the developments in the Bulgarian economy before and after the adoption of the CBA is beyond the scope of this study (see Minassian, Nenova, Yotzov, 1998, pp. 5 – 84; Yotzov, Nenovsky, Hristov, Petrova, Petrov, 1998, pp. 7 – 21; Gulde, 1999, pp. 2 – 5; Avramov, 1999, pp. 9 – 16). We would rather focus on the design of the financial system under the CBA in Bulgaria and the resulting im-

plications for the role of reserve management operations in the functioning of the currency board.

## II. The CBA in Bulgaria versus an Orthodox CBA

The CBA in Bulgaria was introduced with the new Law on the Bulgarian National Bank (BNB) of 10 June 1997, issued by the 38th National Assembly. The **structure of the BNB** as defined by Article 19, Section 1 of the Law is comprised of three departments: an Issue Department, a Banking Department and a Banking Supervision Department. The Law sets **the monetary functions and operations of the Bank** according to the general principles of functioning of a typical currency board. There are, however, some differences rendering the Bulgarian CBA to a certain extent more flexible than an orthodox one.

### 1. Common Key Features

Article 20, Section 1 defines the main function of the Issue Department is to **maintain full foreign exchange cover** for the total amount of BNB monetary liabilities by taking actions needed for the efficient management of the Bank's international foreign exchange assets.

Article 29 of the Law **sets the official exchange rate** of the lev to the Deutschemark at BGL 1,000 per DEM 1 and establishes the rule to be used to determine the official exchange rate of the lev to the Euro when it becomes legal tender in Germany.

Article 45 stipulates that the BNB **may not extend credits to the State or any state agency**, except credits against purchases of special drawing rights from the IMF according to an established transparent procedure.

Thus the CBA in Bulgaria enjoys the key features of an orthodox CBA, listed in Table 1.

Table 1

THE CBA IN BULGARIA VERSUS AN ORTHODOX CBA:  
COMMON KEY FEATURES

| An Orthodox Currency Board   | The CBA in Bulgaria |
|--|---------------------|
| Maintains full foreign exchange cover for its note, coin and deposit liabilities as set by law |                     |
| Maintains a truly fixed exchange rate with respect to the reserve currency as set by law       |                     |
| Cannot finance domestic government spending as set by law                                      |                     |

## 2. Main Differences

Table 2 below lists the main differences between the CBA in Bulgaria and a typical currency board (the features of an orthodox CBA are defined according to Hanke and Schuler, 1994, pp. 2–10). Most of them result from some specific considerations on the efficient functioning and credibility of the arrangement in the case of Bulgaria in view of the banking crisis preceding the adoption of the currency board.

Table 2

### THE CBA IN BULGARIA VERSUS AN ORTHODOX CBA: MAIN DIFFERENCES

| An Orthodox Currency Board                             | The CBA in Bulgaria   |
|--|---|
| Usually supplies only notes and coins                  | Supplies notes, coins and deposits as well  |
| Does not regulate commercial banks                     | Regulates commercial banks  |
| Is not a lender of last resort                         | Strictly limited lender of last resort  |
| Earns all seigniorage only from interest on its assets | Earns almost all seigniorage only from interest   |
| Full convertibility (both current and capital account) | Full current account convertibility but still restricted capital account convertibility (due to be changed) |

Article 28, Section 2 **defines the monetary liabilities** of the BNB as consisting of all banknotes and coins in circulation issued by the BNB and any balances on accounts held by other parties with the BNB, with the exception of the accounts held by the IMF. According to Article 43, the BNB is the official depository of the State. By Article 41 commercial banks are required to keep minimum reserve requirements with the BNB. Therefore, the CBA in Bulgaria **supplies notes, coins and deposits** (the government deposit and commercial bank reserves), while an orthodox CBA typically supplies only notes and coins. The reasons for this difference are discussed in the sections below with reference to minimum reserve requirements and the government deposit.

Article 20, Section 3 defines the main function of the Banking Supervision Department is to **supervise the banking system** in accordance with the rules provided for by law and the regulations for its enactment. According to Article 41, Section 1, the BNB determines by regulation the minimum reserve requirements which commercial banks are required to keep with the BNB. By Article 41, Section 2 the BNB establishes by a regulation any other terms and requirements for the mainte-

nance of the stability of the banking system. Currently there are about 15 different **regulations issued by the BNB** such as Regulation No. 21 on the Minimum Required Reserves, Regulation No. 6 on Extending Collateralized Loans to Banks, Regulation No. 8 on the Capital Adequacy, Regulation No. 11 on Liquidity Management and Supervision, Regulation No. 4 on Foreign Currency Positions, Regulation No. 9 on the Evaluation of Risk Exposures of Banks and the Allocation of Provisions to Cover the Risk Related Thereto, *et alia*. By contrast, a typical currency board does not regulate commercial banks. Banking regulations in a currency board are few and are enforced by the ministry of finance or an office of bank regulation (Hanke and Schuler, 1994, p. 7). In Bulgaria, however, the banking crisis that preceded the adoption of the CBA suggested that the soundness of banks would be vital for the viability of the CBA itself. Therefore, a strong office of bank regulation was needed. Given its existing supervisory infrastructure, the BNB appeared to be the most appropriate institution for that purpose. Nevertheless, it is difficult to say whether the following two peculiarities regarding the Banking Supervision Department are an advantage or disadvantage of this approach:

- in order to carry out its activities the Banking Supervision Department shares both the budget of the BNB and all existing facilities within the Bank;
- the activities of the Banking Supervision Department are coordinated to some extent with those of the other departments through the Managing Board of the BNB.

The most important deviation from the principles of an orthodox currency board in respect of regulation, however, is the maintenance of minimum reserve requirements with the BNB as provided for by the Law (and regulated by the Banking Supervision Department). Its impact is discussed in more detail in the section devoted to monetary policy operations.

Article 20, Section 2 of the Law on the BNB states that the Banking Department shall perform the **lender of last resort function** in case any systemic risk for the stability of the banking system arises. On the contrary, an orthodox CBA is not a lender of last resort (LLR). This difference is also mainly due to the banking crisis that preceded the adoption of the CBA in Bulgaria. A strictly limited LLR function in the case of Bulgaria was assumed to render higher credibility to the arrangement than no LLR because of the fragile stability of the banking system. To this end, the Law on the BNB establishes a clear procedure for the LLR function under a systemic risk. It is discussed in more de-



tail in the section devoted to monetary policy operations.

Article 30 gives the BNB the right to charge reserve currency exchange transactions against leva up to 0.5 percent from the official exchange rate. Actually, by a decision of the Managing Board the BNB sells Deutschmarks at the official exchange rate of BGL 1,000 per DEM 1 and buys them at BGL 995 per DEM 1. Therefore, the CBA in Bulgaria earns a small portion of its seigniorage from commissions, while a typical currency board earns seigniorage only from interest on its assets. In reality, income from commissions is far below 1 percent of total income and covers mainly the expenses for servicing transactions with the public. Hence, the CBA in Bulgaria **earns almost all seigniorage only from interest on its assets**.

The last difference between an orthodox CBA and the CBA in Bulgaria (of those listed in Table 2) regards the convertibility of the domestic currency. Although it has full current account convertibility, **the Bulgarian lev is not fully convertible yet**, because of the restrictions on capital account transactions arising from the old Law on Transactions in Foreign Exchange Valuables and Currency Control<sup>1</sup>. By contrast, a typical currency board has full convertibility of its currency. This feature is important, because it enables market forces alone to determine the money supply process through a self-adjusting equilibrium of the balance of payments (see Hanke and Schuler, 1994, pp. 29 – 41). Capital account liberalization, however, enhances the probability of self-fulfilling currency crises due to increased mobility of portfolio investments (see Nenovsky, Hristov, Petrov, 1999, p. 25). Therefore, it is difficult to say whether the CBA in Bulgaria would have benefited or suffered if unrestricted capital account transactions had been permitted from the very beginning of its functioning.

### *3. Equal Advantages*

The main advantages of the CBA in Bulgaria are summarized in Table 3. Essentially they are the same as the main advantages of an orthodox currency board system. The Law on the BNB provides for a maximum **transparency** on its design and also on its activities, since by Article 49 the balance sheet of the Issue Department is published on a weekly basis. The CBA was established and fulfilled its main purpose quickly, i. e. its adoption resulted in a **rapid monetary reform** (see Yotzov, Nenovsky, Hristov, Petrova, Petrov, 1998, pp. 7 – 8; Gulde, 1999, pp. 19 – 20). **Monetary policy has been bound to the rules**

<sup>1</sup> This is going to be changed with the adoption of an entirely new law.

listed in Table 1, so that the monetary base cannot increase independently of the monetary authority of the country whose currency has been chosen as reserve and **it is impossible to create inflation** by discretionary issuing of domestic currency. **Protection from political pressure** has been guaranteed to the extent that hardly there will ever be a consensus in the National Assembly to change the Law on the BNB. Yet the design of the CBA in Bulgaria has been flexible enough (Table 2) to address the specific problems of the banking system that were in place before its adoption. As a result, the adoption of the CBA in Bulgaria was successful and the most important advantage of an orthodox currency board – **high credibility** – has been achieved.

Table 3

**THE CBA IN BULGARIA VERSUS AN ORTHODOX CBA:  
EQUAL ADVANTAGES**

| An Orthodox Currency Board | The CBA in Bulgaria                |
|----------------------------|------------------------------------|
|                            | Transparency                       |
|                            | Rapid monetary reform              |
|                            | Rule-bound monetary policy         |
|                            | Protection from political pressure |
|                            | Cannot create inflation            |
|                            | High credibility                   |

Thus, in the case of Bulgaria the success of the CBA critically depended on the special design of the currency board, being both sufficiently rule-bound to be credible, while allowing flexibility at the margin on account of the banking crisis (see Gulde, 1999, pp. 14 – 15). All the same, mainly because of the existing small room for monetary policy operations, the CBA in Bulgaria is not considered orthodox but a currency board-like system. It falls in the same group with Argentina and Estonia, whose central banks also mimic currency boards (Hanke and Schuler, 1994, pp. 47 – 57).

### III. Monetary Policy Operations

In a fully liberalized system, including full convertibility (both current and capital account), the central bank cannot set both an independent domestic monetary policy and the exchange rate (see Gray and

Hoggarth, 1996, p. 8; Hanke and Schuler, 1994, p. 19; Latter, 1996, p. 24). Therefore, a typical currency board has to accept the interest rate and the quantity of domestic money corresponding to the fixed exchange rate and there should be no room for monetary policy operations. It is important to know why the Law on the BNB has left some room for such operations in the case of Bulgaria, and what kind of problems could arise from their use in contradiction with the operating principles of an orthodox CBA.

### *1. Reserve Requirements*

Reserve requirements are subject to Regulation No. 21 on the Minimum Required Reserves, issued by the BNB according to Article 41 of the Law on the BNB. Its main provisions are as follows:

- the basis on which the amount of minimum required reserves is determined includes banks' liabilities both in Bulgarian levs and foreign currency (Article 2);
- banks maintain minimum required reserves in the amount of 11 percent of their deposit base (Article 3) either in levs, Euro, US dollars or Swiss francs (Article 4);
- reserve requirements are averaged on a monthly basis (Articles 6 – 8) but should a bank use over 50 percent of them, it shall pay interest for the excess over the 50 percent for each day of use (Article 11);
- the BNB may decide to pay interest on the lev component of the minimum required reserves but its rate may not exceed the income which the BNB receives from its investments in Euro (Article 5).

The level of reserve requirements has been set at 11 percent and has not been changed since the adoption of the CBA in Bulgaria. This is not strange in the context of the long-run role of reserve requirements as a monetary policy tool to influence the money multiplier and the money supply by changing the level of requirements in a discretionary manner, which is incompatible with the principles of a currency board. Hence, although not provided for by law, the option of changing the level of reserve requirements should be viewed as almost theoretical (maybe existing only for severe emergencies generating systemic risk for the stability of the banking system).

In the case of the CBA in Bulgaria, reserve requirements play predominantly their short-run role to **suppress excessive volatility of daily market interest rates** by allowing reserve averaging and permitting banks to have an automatic recourse to their cash balances with the BNB on a daily basis. However, the BNB currently does not pay interest

on reserve requirements. Less than fully remunerated reserve requirements are a tax on the banking system, which is absent in a typical currency board. Therefore, the option to remunerate reserves should be used by the BNB in order to minimize distortions and get closer to an orthodox approach. The extent to which remuneration of reserves is possible can be determined with the general equation derived in the section devoted to the role of reserve management.

The most radical solution, however, is to eliminate reserve requirements, leave the banks themselves to determine the amount of reserves held with the BNB for settlement purposes (as suggested in Nenovsky and Hristov, 1998, p. 41) or/and make reserves fully remunerated (as suggested above).

## ***2. Lender of Last Resort (LLR)***

The strictly limited LLR function of the Banking Department is subject to Regulation No. 6 on Extending Collateralized Loans to Banks as required by Articles 19 and 33 of the Law on the BNB. The main provisions are as follows:

- in the event of a liquidity risk affecting the stability of the banking system the BNB may extend credits to solvent banks experiencing acute need of liquidity but only against collateral of liquid assets (Articles 19 and 33 of the Law, Article 2 of the Regulation);
- the existence of a liquidity risk is determined by Articles 4 and 5 of the Regulation as a function of the delays of settlement transactions in the Banking Integrated System for Electronic Transfer (BISERA);
- credits may be extended only up to the amount of available funds on the Banking Department deposit placed with the Issue Department (Article 33 of the Law, Article 2 of the Regulation);
- credits may be extended only as a temporary short-term support with original term of up to 30 days, and renewed no more than twice (Article 33 of the Law, Article 8 of the Regulation);
- the decisions on loan applications have to be made by the Managing Board of the BNB under clear lending procedures, described in Articles 12 – 14 of the Regulation.

In a typical currency board system there is no LLR function because foreign exchange transactions may operate as a standing facility – the market can always adjust its holdings of domestic currency reserves by executing foreign exchange transactions against the reserve currency. However, banks may experience liquidity problems for a very short term if foreign exchange transactions can be settled only in two days (which

is the international standard and the normal practice in Bulgaria). Reserve averaging discussed above helps to overcome this problem to a certain extent but only when there is no systemic liquidity risk in the banking system as a whole. Given the fragile stability of the banking system in Bulgaria at the time of CBA adoption, it was reasonable to leave this strictly limited LLR function. It is applicable only to systemic risk situations as provided for by law and hardly could be used to abuse the operating principles of an orthodox currency board. On the contrary, the LLR function in the case of Bulgaria has even contributed to the arrangement credibility.

### *3. Open Market Operations (OMO)*

The Law on the BNB prohibits open market operations, since by Article 45 the BNB may not extend credits in whatever form to the government except credits against purchases of special drawings rights from the IMF. Securities issued or guaranteed by the government are not permissible as reserves (Article 28, Section 3) and can serve only as collateral against credits according to the LLR function discussed above (Article 33 of the Law and Article 6 of Regulation No. 6). The abolishment of OMO as a monetary policy tool of the BNB is fully in line with the principles of an orthodox currency board.

However, some small room for OMO-like operations has been left to the Ministry of Finance. According to Article 43, Section 3, the BNB acts as an agent for government and government guaranteed debt. This function is subject to Regulation No. 5 on the Terms and Procedure for Issuance, Acquisition and Redemption of Book-entry Government Securities. Its main provisions are as follows:

- the BNB organizes the activities in relation to the sale of government securities on behalf and for the account of the government according to a contract signed with the Ministry of Finance (Article 2);
- government securities are acquired in the primary market through auctions organized by the Fiscal Services Department of the BNB according to a predetermined schedule or by a decision of the Minister of Finance as established by Articles 3 – 8;
- secondary market transactions between primary dealers, non-primary dealers and physical and legal persons are registered by the Fiscal Services Department of the BNB according to a set of clear procedures established by Articles 9 – 22;
- the Ministry of Finance provides the necessary funds for the redemption of the government securities and interest thereon in a

special account opened with the BNB no later than one working day prior to redemption (Article 27);

- reverse repurchase of government securities prior to maturity is allowed by a decision of the Minister of Finance at the auctions held by the BNB by replacing them with government securities of a new issue or by redemption of the nominal value and interest thereon (Article 30).

It is clear that the role of the Fiscal Services Department of the BNB in the government securities market is a passive one (just an agent of the Ministry of Finance), while the Ministry of Finance plays an active role by determining the schedules of new issues, the amounts issued and the amounts repurchased prior to maturity. This in theory enables the Ministry of Finance to influence the liquidity of the banking system and money supply in an OMO-like manner, since according to Article 43, Section 1 of the Law on the BNB the funds of the government are deposited with the BNB. The problem is discussed in more detail in the section devoted to the government deposit, because it arises, first of all, from the presence of government funds in the financial system, not from government debt management by the Ministry of Finance.

#### ***4. Base Interest Rate***

The BNB is obliged to announce the base interest rate in compliance with Article 35 of the Law on the BNB, which also gives the Managing Board the right to determine the method to be used. Currently the base interest rate is announced as the average yield on three-month government treasury bills for each auction held by the Fiscal Services Department in the primary market (see above)<sup>2</sup>. As a result, the market is distorted in two major respects:

- in order to minimize its costs the Ministry of Finance is interested in deliberately forcing the yield down (and hence the base interest rate) by reducing the supply of treasury bills;
- interbank rates may be influenced by the base interest rate announced by the BNB if banks use it as a benchmark.

Although the BNB does not set but only announces the base interest rate, there is a contradiction with the currency board rules. Under a fixed exchange rate regime the market alone should determine interest rates (see Gray and Hoggarth, 1996, p. 8; Hanke and Schuler, 1994, pp. 40 – 41; Latter, 1996, p. 24). It is true that reducing the cost of financing of the government could seem a benefit in the short run, but in the

<sup>2</sup> Initially one-week treasury bills were used.

long run this could become an obstacle to building an efficient financial market, since participants tend to avoid markets where prices appear to be artificially controlled.

One possible solution could be to change the method of announcing the base interest rate. For example, it could be driven by the interbank market like LIBOR and other similar reference rates. However, this could generate other problems because of the underdeveloped interbank market in Bulgaria. Another more radical solution is to abolish the base interest rate (see Nenovsky and Hristov, 1998, p. 41). But this would require changing the Law on the BNB and several other laws that refer to the base interest rate announced by the BNB. Therefore, at least for the time being, elimination would be rather difficult.

### *5. Commissions*

The BNB is bound to exchange reserve currency against leva on the basis of spot exchange rates, which cannot depart from the official exchange rate by more than 0.5 percent, inclusive any fees and commissions (Article 30 of the Law on the BNB). The Managing Board has decided to sell Deutschemarks at BGL 1,000 per DEM 1 and buy at BGL 995 per DEM 1. In theory the Managing Board has the right to change these rates (for example to sell at BGL 1,005 per DEM 1 and buy at BGL 1,000 per DEM 1). However, any such change may affect the foreign exchange market and could trigger a shock in the monetary system due to changes in capital movements. Therefore, the option to change commissions should remain only theoretical, unless maybe a decision on charging no commission is taken. In fact, in an orthodox approach commission fees are supposed to worsen the link to the reserve currency, especially for short-term capital movements, because they impose high costs relative to the benefits of arbitrage (Hanke and Schuler, 1994, pp. 76 – 77). Hence, an orthodox currency board does not earn seigniorage on fees. To place low limits on commission fees of financial intermediaries, it is sufficient to give the public the choice of dealing directly with the currency board, as it is in the case of the Bulgarian CBA. The social benefits are considered to be much higher than the income that commission fees could bring to the currency board (Hanke and Schuler, 1994, pp. 76 – 77). However, there is also a sound objection to this statement because short-term capital movements are able to trigger shocks in the monetary system. Therefore, social benefits could be higher when, by applying permanently fixed low commission fees, the currency board discourages short-term arbitrageurs and speculators. Anyway, the Bulgarian market has already adjusted to the current commission fees

and it seems best to avoid any changes.

### *6. Purchase of Gold*

According to the old Law on Transactions in Foreign Exchange Valuables and Currency Control, the BNB is permitted to purchase gold extracted in Bulgaria<sup>3</sup>. By Article 28, Section 6 of the Law on the BNB gold is included in the international foreign exchange reserves covering the monetary liabilities of the BNB. Therefore, the purchase of gold against Bulgarian leva as an operation is quite similar to the purchase of reserve currency against leva as both of them increase the amount of domestic currency in circulation. This feature is absent in a typical currency board. In fact, if the BNB were allowed to both purchase and sell unlimited amounts of gold against Bulgarian leva, then gold could play the role of domestic securities for OMO. In practice, however, the BNB may only purchase gold against leva and after the adoption of the CBA in Bulgaria the amounts purchased have substantially decreased. If market forces alone determine whether production of gold will result in an increase of the amount of domestic currency in circulation (by exchanging gold against reserve currency and then converting it into domestic currency) then there is no contradiction with the rules of an orthodox CBA. Therefore, it would be better to eliminate the right of the BNB to purchase gold against domestic currency. The BNB should be enabled to execute any transactions in gold only against the reserve currency (or other foreign currencies).

## **IV. The Financial System under the CBA in Bulgaria**

The financial system under the Bulgarian CBA has the following three main layers:

1. The **Issue Department** and the **Banking Department** of the BNB;
2. **Commercial banks** (supervised by the **BNB Banking Supervision Department**);
3. **The public** (including nonbanking financial institutions).

The **government** is another special participant in the financial system:

- it keeps its funds deposited with the Issue Department of the BNB;
- it organizes the market for government securities through the **BNB Fiscal Services Department** and services the domestic government debt;

<sup>3</sup> Now this is going to be changed with the adoption of an entirely new law.



- it borrows from the **IMF** and other international financial institutions and services the foreign government debt;
- it collects taxes and spends on salaries, pensions, subsidies, etc. in the budgetary sector;
- it also receives part of the seigniorage earned by the BNB.

Because of specific balance sheet items and corresponding flow channels, the financial system under the CBA in Bulgaria differs from that of an orthodox currency board and from a typical central bank.

### 1. Balance Sheets

Figure 1 represents the main items on the aggregated balance sheets of the Issue Department, the Banking Department, commercial banks and the public (items on the left-hand side are assets, items on the right-hand side are liabilities).

The balance sheet of the Issue Department contains the following items:

- FX** – foreign exchange reserves (as defined by Article 28 of the Law on the BNB);
- C** – currency in circulation;
- R** – reserves of commercial banks;
- G** – the government deposit with the Issue Department<sup>4</sup>;
- B** – the Banking Department deposit with the Issue Department (the excess of the lev equivalent of foreign exchange reserves over the total amount of BNB monetary liabilities as defined by Article 28 of the Law on the BNB).

Figure 1

#### MAIN BALANCE SHEET ITEMS IN THE FINANCIAL SYSTEM OF THE CBA IN BULGARIA

| Issue Department |   | Banking Department |                         | Commercial Banks |  | Public          |          |
|------------------|---|--------------------|-------------------------|------------------|--|-----------------|----------|
| FX               | C | B                  | L <sup>IMF</sup><br>... | C                | D<br>L <sup>d</sup><br>...<br>FX <sup>B</sup><br>... | C               | L<br>... |
|                  | R | L <sup>d</sup>     |                         | R                |  | D               |          |
|                  | G | RG                 |                         | L                |  | S               |          |
|                  | B | ...                |                         | S                |  | FX <sup>P</sup> |          |
|                  |   |                    |                         | FX <sup>B</sup>  |  | ...             |          |

<sup>4</sup> Actually, **G** includes also a negligible amount (less than 1 percent of **FX**) of nongovernment deposits. For the sake of simplicity we do not separate them from the funds of the government, since their impact on the financial system is only marginal and it is essentially the same as the effect caused by the funds of the government.

The balance sheet of the Banking Department includes:

- B** – the Banking Department deposit with the Issue Department;
- L<sup>d</sup>** – discount loans extended to commercial banks according to the strictly limited LLR function of the Banking Department (as already discussed above);
- RG** – receivables from government (corresponding to government borrowings from the IMF);
- L<sup>IMF</sup>** – borrowings from the IMF;
- ...** – other items, inherited from the balance sheet of the BNB before the adoption of the CBA in Bulgaria and not related to its functioning (on the liability side – capital, reserves, *et alia*; on the asset side – IMF quota, *et alia*).

The items on the balance sheet of the commercial banks are as follows:

- C** – currency (held by banks);
- R** – reserves of commercial banks;
- L** – loans extended to the public;
- S** – domestic government securities;
- D** – deposits of the public;
- L<sup>d</sup>** – borrowings from the Banking Department (discount loans);
- FX<sup>B</sup>** – net foreign assets held by banks;
- ...** – other items (on the liability side – capital, reserves, *et alia*; on the asset side – investments, *et alia*).

The main items on the aggregated balance sheet of the public have already appeared above:

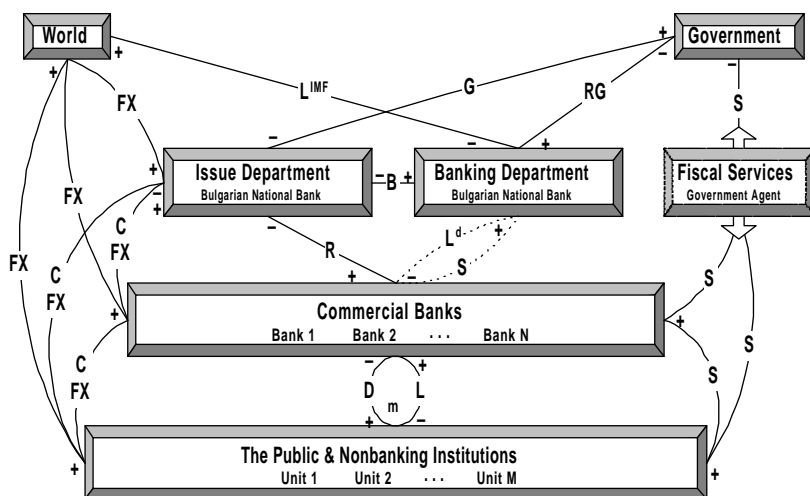
- C** – currency (held by the public);
- D** – deposits with commercial banks;
- S** – domestic government securities;
- L** – borrowings from commercial banks;
- FX<sup>P</sup>** – net foreign assets held by the public;
- ...** – other items.

## 2. Flow Channels

The main flow channels in the financial system correspond to the main items in the balance sheets (**FX**, **C**, **R**, **D**, **L**, **S**, **G**, **L<sup>IMF</sup>**, **RG**, **B**, **L<sup>d</sup>**). They are represented in Figure 2 as arrows connecting the different layers in the financial system. The ‘plus’ and ‘minus’ signs indicate whether an item appears on the asset or liability side of the balance sheets between which the corresponding flow occurs.

Figure 2

### FLOW CHANNELS IN THE FINANCIAL SYSTEM OF THE CBA IN BULGARIA



The Issue Department issues domestic currency (C) against foreign exchange reserves (FX), which connect it to the world. It is linked to the Banking Department through its deposit (B). The government issues securities (S) to the commercial banks and the public (the Fiscal Services Department of the BNB being just an agent for that purpose) and deposits all of its funds with the Issue Department (G). Government foreign debt operations go as flow (G, FX) through the Issue Department but borrowings from the IMF ( $L^{IMF}$ ) also go as a separate item to the Banking Department liabilities. Thus, if utilized by the government within 90 days (as provided for by Article 45 of the Law on the BNB) they increase by equal amounts FX,  $L^{IMF}$  as well as the Banking Department receivables from government (RG) and the government deposit with the Issue Department (G). Otherwise, except FX and  $L^{IMF}$  they increase only the size of the Banking Department deposit (B) and serve as IMF support for the CBA. The commercial banks (supervised by the Banking Supervision Department) maintain reserves with the Issue Department (R) and only in the event of a liquidity risk (as defined by the Law on the BNB and Regulation No. 6) they may borrow limited amounts from the Banking Department against collateral ( $L^d$ , S). The flow (D, L), circling between the commercial banks and the public, gives rise to a deposit multiplication process characterized by a specific

money multiplier  $\mathbf{m}$ . The commercial banks and the public can also exchange domestic currency ( $\mathbf{C}$ ) and foreign assets ( $\mathbf{FX}$ ), which independently connect them to the world. Finally, it is important to note that Figure 2 represents only the flow channels in the financial system and not the exact economic events (such as tax collection, salary payments, trade, production, government debt operations, transfer of seigniorage earned by the Issue Department to the government, etc.), which lead to flow generation.

### 3. Money Supply

Let  $\mathbf{M}^b$  be the monetary base,  $\mathbf{M}$  – the money supply and  $\mathbf{m}$  – the money multiplier.

Then,

$$\mathbf{M}^b = \mathbf{C} + \mathbf{R} = \mathbf{FX} - \mathbf{G} - \mathbf{B},$$

$$\mathbf{M} = \mathbf{C} + \mathbf{D} = \mathbf{m} \cdot \mathbf{M}^b,$$

$$\mathbf{m} = (\mathbf{1} + \mathbf{c})/(\mathbf{c} + \mathbf{r}),$$

where  $\mathbf{c}$  is the cash to deposits ratio and  $\mathbf{r}$  is the reserves to deposits ratio.

Hence, under the CBA in Bulgaria the money supply is determined by

$$\mathbf{M} = \mathbf{m} \cdot [\mathbf{FX} - \mathbf{G} - \mathbf{B}].$$

From this equation the following important conclusions can be drawn:

- *ceteris paribus*, changes in  $\mathbf{FX}$ , which are not related to equal changes in  $\mathbf{B}$  or  $\mathbf{G}$ , proportionally cause identical changes in the money supply. Such changes arise from exchange of domestic currency against reserve currency by the public or the commercial banks;

- *ceteris paribus*, changes in  $\mathbf{B}$ , which are not related to equal changes in  $\mathbf{FX}$ , proportionally cause inverse changes in the money supply. Such changes arise from covering the BNB operating and investment costs and possible exercise of the LLR function of the Banking Department;

- *ceteris paribus*, changes in  $\mathbf{G}$ , which are not related to equal changes in  $\mathbf{FX}$ , proportionally cause inverse changes in the money supply (see also Nenovsky and Hristov, 1998, pp. 16 – 18). Such changes arise from issuance and redemption of securities, tax collection, payment of salaries, pensions and subsidies from the state budget and all other types of budgetary operations executed in the domestic market.

The first conclusion reveals the exact meaning of the concept of '*rule-bound monetary policy*', which is one of the key features of any currency board system. The second one is not surprising, knowing that in general the money supply is positively related to the level of discount loans (Mishkin, 1992, p. 350), which is strictly limited in the case of the CBA in Bulgaria. The third conclusion, however, is an embarrassing one, since it could be interpreted as a possibility to conduct monetary policy through the government deposit, which contradicts the currency board rules. We address this important issue in a separate section.

#### 4. *The Government Deposit*

The presence of the government deposit in the liabilities of the Issue Department is something atypical of a currency board. An immediate negative consequence, which we have just discussed, is the fact that the Ministry of Finance, wittingly or not, conducts monetary policy operations by controlling domestic inflows to and outflows from its funds **G**. Solutions have been proposed to switch the government deposit to commercial banks or even to a separate institution (Nenovsky and Hristov, 1998, p. 40). However, we would argue that in the case of Bulgaria the least dangerous solution for the financial system as a whole is to keep all funds of the government deposited with the Issue Department.

First of all, let us estimate the relative size of government funds two years after the introduction of the currency board: **G** accounts for about 30 percent of the money supply<sup>5</sup> (broad money) in Bulgaria and about 40 percent of the foreign exchange reserves **FX**. Next, let us see what really stays behind the opportunity to effect monetary policy operations with government funds: the possibility to decide whether to keep money invested in the domestic market or abroad. Finally, let us see what happens when the funds of the government are deposited with the Issue Department: according to the currency board rules all funds are invested abroad (the international financial markets).

Now, let us see what would happen if the funds of the government were deposited outside the Issue Department: somebody would be allowed to decide in a discretionary manner whether to invest the money in the domestic market or abroad (no matter whether it would be the managing board of a separate institution or a big commercial bank). This could be much more dangerous for the financial system, given the huge size of funds and the sorry record before the adoption of the CBA

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<sup>5</sup> Note that government funds are not included in the money supply when deposited with the Issue Department.

of conducting monetary policy operations in favor of bankrupt institutions seeking for liquid assets.

It is interesting to note that the two extreme cases of investing all government funds abroad or investing them in the domestic market are **dual** in the following sense:

- if all funds are invested abroad, then budgetary operations in the domestic market cause changes in money supply, while such operations in the international markets (e. g. foreign debt operations) do not affect it;
- if all funds are invested in the domestic market, then domestic budgetary operations do not affect money supply, while budgetary operations in the international markets cause changes.

Investing all funds in the domestic market is only theoretically possible under a currency board and any mixture between the two extreme cases is equivalent to giving somebody else the power to affect the money supply in a discretionary manner. This will not be a problem if there is an efficient market to absorb the huge amount of government funds but this is not the case of Bulgaria. Hence, in our view, the least dangerous solution for the stability of the banking system is to keep the funds of the government deposited with the Issue Department (at least for the time being), despite the ability of the Ministry of Finance to influence money supply by domestic budgetary operations. There is yet another advantage of this approach: it provides maximum transparency on the activities of the government because of the weekly publishing of the Issue Department balance sheet.

It is clear that monetary policy will always exist in one form or another based on rules or discretion (Nenovsky and Hristov, 1998, p. 40). The CBA in Bulgaria just shifts greater responsibility for financial conditions from the banking sector to the budgetary policies of the government.

## V. The Role of Reserve Management Operations

Reserve management operations play a key role in the functioning of a currency board. However, it is not a simple task to describe it without going into rather technical details. It is easier to advise on quite general issues concerning prudence (like Enoch and Gulde 1997, pp. 18 – 20; Hanke and Schuler, 1994, pp. 78 – 80) or to criticize mistaken understanding (as revenue maximization is criticized in Gulde, 1999, p. 17). Nevertheless, what we have tried to do is to provide a more in-depth cover of this role, avoiding any tremendous sophistication.

The **main objectives** of reserve management operations evolve from

the Law on the BNB:

- to guarantee full foreign exchange cover for the monetary liabilities of the Issue Department with quality foreign assets (Articles 20 and 28);
- to guarantee unconstrained exchange of domestic currency against reserve currency (Article 30);
- to guarantee an annual excess of revenue over expenditure (Article 8).

These objectives are directly assigned to the Treasury Directorate (within the Issue Department), which executes all transactions needed for the efficient management of foreign exchange reserves.

The Law stipulates the following **main restrictions** on reserve management operations:

- all convertible foreign currencies are permitted (Article 28);
- the currency mismatch in the balance sheet for any foreign currency other than the Deutschemark should not be higher than two percent (Article 31);
- permissible holdings are gold, notes and coins, funds on accounts with foreign central banks or institutions, debt instruments and repurchase agreements, whereof obligations should be assigned one of the two highest ratings by two international rating agencies (Article 28)<sup>6</sup>.

The highest possible ratings prevent from default losses from reserve management operations. Thus, the Law eliminates **credit risk**. For the sake of simplicity it could be also assumed that there is no **operational risk**.

Therefore, any failure to meet the main objectives of reserve management operations could result only from uncontrolled market risk, i. e. **currency risk** and **interest rate risk**.

The presence of more than one foreign currency in the assets of the Issue Department is atypical of a currency board and it is due to the peculiarities in the design of the CBA in Bulgaria:

- the government deposit contains accounts in several foreign currencies;
- reserves of commercial banks are also allowed to be in foreign currencies;
- monetary gold is also included in the foreign exchange reserves<sup>7</sup>.

<sup>6</sup> Although formally allowed by the Law, the use of derivatives is strictly limited and, at least for the time being, it is virtually prohibited.

<sup>7</sup> By Article 28 of the Law on the BNB gold is valued at DEM 500 per troy ounce, or at the market value, if lower.

Currency risk is strictly limited, because of the strictly limited currency mismatch in the balance sheet (only gold could generate substantial unrealized losses but they are also limited to the extent that price of gold could not fall below the relatively high worldwide costs of extraction).

There are no specific limits set by the Law on interest rate risk.

Any negative change in the market value of assets leads to an equal negative change in the excess cover for the monetary liabilities of the Issue Department, which is measured by the size of the Banking Department deposit (**B**). Since the size of **B** does not depend only on the effect of reserve management operations but also on other factors, it is appropriate to apply an A/L approach in order to distinguish between (and measure separately) the effects of all different factors that cause changes to it. This is the starting point for quantification of our analysis.

### 1. The Banking Department Deposit

The excess cover for the liabilities of the Issue Department, measured by the size of the Banking Department Deposit, should never fall below a certain lower limit  $Z \geq 0$ , threatening the credibility of the CBA. Let  $B \geq Z$  be the size of the Banking Department deposit at time **T** (measured in Bulgarian leva) and the currency structure of the balance sheet of the Issue Department (see Figure 3) is defined by:

$i = 1, 2, \dots, n$  – currency number staying for BGL, EUR, USD, JPY, CHF, XAU, *et alia*;

$A_i \geq 0$  – the amount of assets in currency number  $i$ ;

$L_i \geq 0$  – the amount of liabilities in currency number  $i$ ;

$e_i \geq 0$  – the exchange rate of currency number  $i$  against the Bulgarian lev.

Figure 3

#### THE BANKING DEPARTMENT DEPOSIT: EXCHANGE RATE AND VOLUME EFFECTS

| Issue Department (at Time T) |                 | Issue Department (at Time T + ΔT)             |   |
|------------------------------|-----------------|---|---|
| $A_1 \cdot e_1$              | $B$             | $[A_1 + \Delta A_1] \cdot [e_1 + \Delta e_1]$ | $B + \Delta B$                                |
| $A_2 \cdot e_2$              | $L_1 \cdot e_1$ | $[A_2 + \Delta A_2] \cdot [e_2 + \Delta e_2]$ | $[L_1 + \Delta L_1] \cdot [e_1 + \Delta e_1]$ |
| ...                          | $L_2 \cdot e_2$ | ...   | $[L_2 + \Delta L_2] \cdot [e_2 + \Delta e_2]$ |
| $A_n \cdot e_n$              | ...             | $[A_n + \Delta A_n] \cdot [e_n + \Delta e_n]$ | ...   |
|                              | $L_n \cdot e_n$ | $[L_n + \Delta L_n] \cdot [e_n + \Delta e_n]$ |   |



Let at time  $T + \Delta T$  the amounts of assets and liabilities and the exchange rates have changed to  $A_i + \Delta A_i$ ,  $L_i + \Delta L_i$  and  $e_i + \Delta e_i$  (see Figure 3) causing the size of the Banking Department deposit to change to  $B + \Delta B$ . Then

$$B = \sum_i [A_i - L_i] \cdot e_i,$$

$$B + \Delta B = \sum_i [A_i + \Delta A_i - L_i - \Delta L_i] \cdot [e_i + \Delta e_i].$$

Let the average amounts of assets and liabilities and the average exchange rates be defined as:

$$\bar{A}_i = 0.5 \cdot [A_i + (A_i + \Delta A_i)],$$

$$\bar{L}_i = 0.5 \cdot [L_i + (L_i + \Delta L_i)],$$

$$\bar{e}_i = 0.5 \cdot [e_i + (e_i + \Delta e_i)].$$

Then, the change  $\Delta B$  in the size of the Banking Department deposit can be attributed to the **exchange rate effect** (caused by changes in exchange rates and mismatches in the currency structure of the balance sheet) and the **volume effect** (caused by a change in the volume of assets and liabilities) as follows:

$$\Delta B = \sum_i \{ [\bar{A}_i - \bar{L}_i] \cdot \Delta e_i + [\Delta A_i - \Delta L_i] \cdot \bar{e}_i \}^8$$

Part of the change in volume is due to external inflows and outflows to each currency group of assets and liabilities and the remaining part is due to a change in the market value (caused by accrued interest and unrealized and realized capital gains and losses). Let  $ACF_i$  be the net inflow/outflow in currency number  $i$  on the asset side and  $LCF_i$  be the net inflow/outflow on the liability side. Then the change in volume of assets and liabilities can be separated into a change in **market value** plus an external **inflow/outflow** as follows (see Figure 4):

$$\Delta A_i = (\Delta A_i - ACF_i) + ACF_i,$$

$$\Delta L_i = (\Delta L_i - LCF_i) + LCF_i.$$

<sup>8</sup> In this equation the mutual effect of the two factors is equally distributed between the two terms related to them.

Figure 4

**THE BANKING DEPARTMENT DEPOSIT: MARKET VALUE  
AND INFLOW/OUTFLOW EFFECTS**

| Issue Department (at Time T+ ΔT)   |   |
|--|---|
| $[A_1 + (\Delta A_1 - ACF_1) + ACF_1] \cdot [e_1 + \Delta e_1]$<br>$[A_2 + (\Delta A_2 - ACF_2) + ACF_2] \cdot [e_2 + \Delta e_2]$<br>$\dots$<br>$[A_n + (\Delta A_n - ACF_n) + ACF_n] \cdot [e_n + \Delta e_n]$ | <p style="text-align: center;"><b>B+ΔB</b></p> $[L_1 + (\Delta L_1 - LCF_1) + LCF_1] \cdot [e_1 + \Delta e_1]$<br>$[L_2 + (\Delta L_2 - LCF_2) + LCF_2] \cdot [e_2 + \Delta e_2]$<br>$\dots$<br>$[L_n + (\Delta L_n - LCF_n) + LCF_n] \cdot [e_n + \Delta e_n]$ |

Hence, the change in the Banking Department deposit can be split further into: **exchange rate effect**, **assets market value effect**, **liabilities market value effect**, and **inflow/outflow effect**:

$$\Delta B = \sum_i \{ [\bar{A}_i - \bar{L}_i] \cdot \Delta e_i + [\Delta A_i - ACF_i] \cdot \bar{e}_i - [\Delta L_i - LCF_i] \cdot \bar{e}_i + [ACF_i - LCF_i] \cdot \bar{e}_i \} ,$$

where:

$\sum_i [\bar{A}_i - \bar{L}_i] \cdot \Delta e_i$  is the **exchange rate effect**;

$\sum_i [\Delta A_i - ACF_i] \cdot \bar{e}_i$  is the **assets market value effect**;

$\sum_i [\Delta L_i - LCF_i] \cdot \bar{e}_i$  is the **liabilities market value effect**;

$\sum_i [ACF_i - LCF_i] \cdot \bar{e}_i$  is the **inflow/outflow effect**.

The final step is to split the inflow/outflow effect by noting that it can be generated in the following ways:

- as a result of asset inflows and outflows (part of  $ACF_i$ ), which are not matched by equal liability inflows and outflows (part of  $LCF_i$ ). In this group fall the **net operating and investment costs** of the bank paid in foreign currency (e.g. expenditure on equipment, income from commission fees, etc.) and any **net borrowings from the IMF**, which have remained unutilized by the government in order to provide support for the CBA.
- as a result of liability inflows and outflows (part of  $LCF_i$ ), which are not matched by equal asset inflows and outflows (part of  $ACF_i$ ). In this group fall the **net operating and investment costs** of the bank paid in domestic currency (e.g. expenditure on salaries and office supplies, income from service fees) and also the net

amount of discount loans extended to commercial banks according to the **LLR function** of the Banking Department.

It is straightforward to identify the **LLR net effect** among all  $LCF_i$  and also the **IMF net effect** among all  $ACF_i$ . The remaining part of the **inflow/outflow effect** equals the **BNB operating and investment costs net effect**. Hence, the final decomposition into different factors of the change in the size of the Banking Department deposit is given by the following equation:

$$\Delta B = \left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{Assets Market} \\ \text{Value Effect} \end{array} \right] - \left[ \begin{array}{c} \text{Liabilities Market} \\ \text{Value Effect} \end{array} \right] - \left[ \begin{array}{c} \text{BNB Operating and} \\ \text{Investment Costs Net} \end{array} \right] - \left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right] + \left[ \begin{array}{c} \text{IMF} \\ \text{Net} \end{array} \right] \quad (*)$$

It is important to note that the exact magnitude of each one of the six factors can be computed with the help of the formulas used to derive it, given that the exact values of all variables that have appeared so far are available (see Figures 3 and 4). In addition, it is not a problem to subdivide each one of them into subfactors for each different currency (see above formulas).

The derived fundamental equation (\*) gives the exact relationship between all different factors that affect the size of the Banking Department deposit and can be used for three main purposes:

1. to check the future stability of the CBA in Bulgaria by performing scenario simulations for all factors (including worst case scenario);
2. to impose limits on the magnitude of one factor by setting the expected magnitude of the other ones (i.e. risk management);
3. to explain changes in the size of the Banking Department deposit in subsequent balance sheets of the Issue Department by measuring the magnitude of each separate factor.

We will combine the first two of these ideas in order to reveal in a more quantitative way the exact role of reserve management operations for the successful functioning of the CBA in Bulgaria.

## *2. Full Foreign Exchange Cover*

Showing that the CBA has full cover for its liabilities with quality foreign assets is the key to assuring confidence in the Bulgarian lev and is the core objective of reserve management operations as set by Article 20, Section 1 of the Law on the BNB.

Since the critical minimum level of the size of the Banking Depart-

ment deposit has been assumed to be  $Z \geq 0$ , it follows that  $B + \Delta B \geq Z \geq 0$  (i. e.  $\Delta B \geq Z - B \geq -B$ ) at any time  $T + \Delta T$ . From a reserve management point of view this means that **the maximum amount of potential losses (both realized and unrealized) is strictly limited so that even in a worst case scenario the size of the Banking Department deposit should not fall below the critical level Z.**

The maximum amount of potential losses (both realized and unrealized) is measured by the worst possible **exchange rate effect** and **assets market value effect** in the derived fundamental equation (\*). It can be interpreted as the maximum value of reserves that has been put at risk during reserve management operations<sup>9</sup>. Thus, the above inequality and the link (\*) **strictly limit the maximum value that can be put at risk during reserve management operations.** The limit can be estimated by projecting the magnitude of the other effects in (\*) in a worst case scenario.

In a worst case scenario, as already stated above, **B** should not fall below its credibility margin  $Z \geq 0$ , i. e.

$$\Delta B \geq Z - B \geq -B.$$

Ideally, this requirement should be satisfied without borrowing from the IMF, since there should be no need to support the currency board externally. Thus, **the IMF net effect** should remain zero<sup>10</sup>. From (\*) it follows that in order to guarantee the efficient functioning of the currency board without external support from the IMF, the following conditions should be satisfied:

$$\begin{aligned} \Delta B = & \left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{Assets Market} \\ \text{Value Effect} \end{array} \right] - \left[ \begin{array}{c} \text{Liabilities Market} \\ \text{Value Effect} \end{array} \right] - \\ & - \left[ \begin{array}{c} \text{BNB Operating and} \\ \text{Investment Costs Net} \end{array} \right] - \left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right] \end{aligned} \quad (**)$$

$$\Delta B \geq Z - B \geq -B$$

From (\*\*) it follows that the size of the Banking Department deposit could be affected negatively by four different types of expenses:

- unrealized and realized losses during reserve management operations, measured by the **exchange rate effect** and the **assets market value effect**;

<sup>9</sup> This should not be confused with VaR, which excludes worst case scenarios.

<sup>10</sup> The option to have an external backing for the stability of the CBA should be viewed as a special important feature, which contributes for its credibility. But ideally if the functioning of the CBA is efficient it should not be used.

- remuneration of funds deposited with the BNB (government funds, bank reserves), measured by the **liabilities market value effect**;
- BNB net expenses, measured by the **BNB operating and investment costs net effect**;
- discount loans extended under the strictly limited LLR function of the Banking Department, measured by the **LLR net effect**.

This means that in a worst case scenario the four types of expenses have to share the permitted amount of change  $Z - B$ . Let  $H \geq 0$  be a projection of the magnitude of both the liabilities market value effect and the BNB operating and investment costs net effect from time  $T$  to time  $T + \Delta T$ . In reality, given their specifics, these expenses cannot fall below a certain limit (i. e. always  $H > 0$ ).

Therefore, the maximum amount available for LLR in a worst case scenario depends on the maximum value that has been put at risk for reserve management purposes:

$$\left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right] \leq B - Z + \left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{Assets Market} \\ \text{Value Effect} \end{array} \right] - H$$

Conversely, if there is a certain lower limit on the funds that should remain available for LLR even in a worst case scenario, then the maximum value that could be put at risk for reserve management purposes is limited by:

$$\left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{Assets Market} \\ \text{Value Effect} \end{array} \right] \geq Z - B + H + \left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right]$$

Thus, the following important conclusion can be drawn:

The maximum value that can be put at risk for reserve management purposes depends on the desired minimum amount of funds available for LLR, the projected liabilities remuneration and BNB operating and investment costs ( $H$ ), the size of the Banking Department deposit ( $B$ ) and its minimum credibility level ( $Z$ ).

Therefore, reserve management operations should be based primarily on strong risk management techniques. Absolute measures of risk should be applied (such as dollar duration) rather than relative measures (such as duration) and worst case scenarios should be simulated by using the two conditions (\*\*).

An important consequence from the last derived inequality is that under certain assumptions about the worst case **exchange rate effect**, the permissible worst case **assets market value effect** can be estimated, i.e. **a limit on the permissible interest rate risk of the foreign exchange**

**reserves can be computed.** This limit can be expressed in different form for any measure of risk.

### *3. Unconstrained Exchange of Reserve Currency*

Given that full foreign exchange cover is guaranteed with the help of the techniques developed in the previous section, then in theory the CBA would survive a worst case scenario both in the international and domestic financial markets. However, this is still not sufficient from the point of view of the second main objective of reserve management, which is to guarantee unconstrained exchange of domestic against reserve currency. Reserves would be structured in a rather inefficient way if temporary unrealized losses have to be realized in order to meet obligations of the CBA under normal circumstances in the domestic market. The risk to have to realize otherwise unrealized losses during reserve management operations is a **liquidity risk**. Therefore, **the liquidity risk should be strictly limited by applying appropriate maturity constraints on the structure of reserves.**

This could be done by analyzing the structure of the obligations of the CBA in Bulgaria, which include:

- domestic currency in circulation;
- the government deposit;
- commercial bank reserves.

For example, it is important to estimate:

- the so-called 'hard core' of domestic currency in circulation, which could never be exchanged against reserve currency;
- the maximum amount of domestic currency that could be exchanged against reserve currency in a short period of time (in a worst case domestic scenario).

Similarly, the structure of government funds should be examined. Different funds could be managed more efficiently as separate portfolios. However, it should be kept in mind that the assets covering the funds of the government inevitably put at risk part of the size of the Banking Department deposit, because of the interrelationship (\*). As a result, a lower value remains to be put at risk for more efficient management of the assets covering the money in circulation and the reserves of commercial banks.

### *4. Minimum Level of Revenue*

The third main objective of reserve management requires that the revenue over an investment horizon of one year should exceed total BNB expenses, i. e.  $\Delta B \geq 0$  in a year. If we assume that the **net LLR ef-**

fect during the year is zero, from (\*\*) it follows:

$$\begin{aligned} & \left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{Assets Market} \\ \text{Value Effect} \end{array} \right] \geq \\ & \geq \left[ \begin{array}{c} \text{Liabilities Market} \\ \text{Value Effect} \end{array} \right] + \left[ \begin{array}{c} \text{BNB Operating and} \\ \text{Investment Costs Net} \end{array} \right] \geq H \end{aligned}$$

Therefore, a certain minimum rate of return (depending on the size of reserves) should be achieved with a very high probability (e.g. 95 per cent), meanwhile trying to maximize the expected return (at the cost of higher risk). Under certain assumptions about the worst case **exchange rate effect**, the derived inequality implicitly imposes a second upper limit on the **interest rate risk** of foreign exchange reserves (the ‘full cover’ requirement has imposed the first limit, see above). For different measures of risk this limit can be expressed in different form.

In order to achieve this objective without failing to meet the other objectives<sup>11</sup>, the Treasury Directorate of the BNB has developed an appropriate method for strategic asset allocation (benchmarking). The method reflects the main strategic issues discussed above. It is interesting that, for the time being, the first limit on interest rate risk (the one imposed by the ‘full cover’ requirement) is slack. With the current size of reserves it is less constraining than the one imposed by the ‘minimum level of revenue’ requirement. **Thus, foreign exchange reserves have been structured according to a benchmark, which guarantees the stability of the CBA in Bulgaria even in worst case scenarios.**

## VI. Conclusions

The CBA in Bulgaria shares the key features of an orthodox currency board but its design is more flexible in view of the banking crisis that preceded its adoption. All the same, it has brought to the Bulgarian economy the same advantages as an orthodox currency board, since most of the differences tend to enhance rather than undermine its credibility.

The design of the currency board could be rendered closer to the orthodox approach by:

- remunerating reserves of commercial banks;
- changing the method of announcing the base interest rate;

<sup>11</sup> Note that a portfolio of fixed income securities can generate an acceptable positive return for a year but it could have a significant unrealized negative return (threatening the full cover for liabilities) in the first several months.

- abolishing purchases of gold against domestic currency.

The flow channels in the financial system under the CBA in Bulgaria differ from those of an orthodox currency board and a central bank. Since all government funds are deposited with the Issue Department, money supply is affected, wittingly or not, by budgetary operations in the domestic market. However, this seems to be the best solution for the stability of the financial system (at least until an efficient financial market develops in Bulgaria), despite the fact that the Ministry of Finance could conduct monetary policy operations to a certain extent.

The stability of the CBA in Bulgaria depends on the size of the Banking Department deposit with the Issue Department. A fundamental equation expresses the relationship between all the factors affecting the size of the Banking Department deposit. It can be used for three main purposes:

1. to check the future stability of the CBA in Bulgaria by performing scenario simulations for all factors (including worst case scenario);
2. to impose limits on the magnitude of one factor by setting the expected magnitude of the other ones (i.e. risk management);
3. to explain changes in the size of the Banking Department deposit in subsequent balance sheets of the Issue Department by measuring the magnitude of each separate factor.

An appropriate analysis of the equation leads to the conclusion that reserve management operations play a key role for the stability of the CBA:

- the maximum value that can be put at risk for reserve management purposes should be strictly limited in line with the initial size of the Banking Department deposit, the projected liabilities remuneration and BNB operating and investment costs and the desired amount of funds available for LLR;
- adequate constraints on the maturity structure of foreign exchange reserves should be imposed in order to avoid realization of losses that otherwise could remain unrealized;
- the value put at risk for reserve management purposes should be strictly limited in line with the requirement to achieve excess of revenues over expenses over a one-year investment horizon with a very high probability.

In order to meet these objectives, an appropriate method for strategic asset allocation and benchmark construction has been developed by the Treasury Directorate of the BNB. Foreign exchange reserves have been structured according to a benchmark, which guarantees the stability of the CBA in Bulgaria even in worst case scenarios.



## Appendix

Handouts of the Presentation at the Operational Monetary Policy Seminar,  
June 23 – 25, 1999, De Nederlandsche Bank, Amsterdam

### The Role of Reserve Management Operations in the Functioning of a Currency Board

Experience of the Treasury Directorate of the Bulgarian National Bank



Prepared by Dobrislav Dobrev, MSc  
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### OBJECTIVES

- Review the reasons to adopt the CBA in Bulgaria;
- Compare the CBA in Bulgaria with an orthodox CBA;
- Examine the main tools of monetary policy operations and check consistency with orthodox currency board rules;
- Present the flow channels and balance sheets in the financial system under the CBA in Bulgaria;
- Examine the money supply process and explain the peculiarities in the design of the CBA in Bulgaria;
- Derive an equation expressing the interrelationship between the factors affecting the stability of the CBA in Bulgaria;
- Analyze the role of reserve management operations in the functioning of the CBA in Bulgaria.

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## Main Reasons to Adopt the CBA in Bulgaria

- The government used to fund deficits of bankrupt state enterprises by supplying subsidies;
- The central bank used to fund deficits of the government by printing Bulgarian levs;
- Commercial banks used to fund deficits of bankrupt state enterprises by supplying loans;
- The central bank used to refinance commercial banks by extending discount loans;
- Insolvent commercial banks triggered a banking crisis;
- The Bulgarian lev depreciated against all major currencies;
- The economy was driven into a hyperinflationary spiral;
- Several stabilization policy attempts failed and key institutions lost their credibility.

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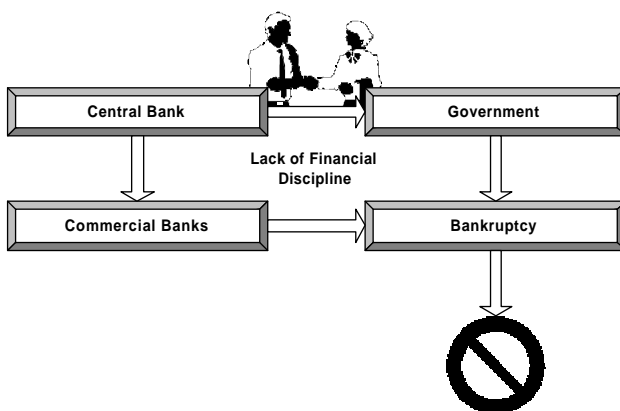
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## Main Reasons to Adopt the CBA in Bulgaria



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## Main Reasons to Adopt the CBA in Bulgaria

- Introduce a rule-based instead of a discretionary mechanism of money supply regulation;
- Impose financial discipline and market-driven commercial culture upon all economic agents;
- Restore financial system credibility;
- Revive the economy.

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## The CBA in Bulgaria versus an Orthodox CBA

- The CBA in Bulgaria was introduced with the new Law on the Bulgarian National Bank (BNB) of 10 June 1997;
- The Law sets the official exchange rate of the Bulgarian lev against the Deutschmark at BGL 1,000 per DEM 1;
- The Law defines the structure of the BNB as comprised of three departments:
  - an **Issue Department** to maintain full foreign exchange cover for the total amount of BNB monetary liabilities;
  - a **Banking Department** to act as lender of last resort in case of systemic risk for the stability of the banking system;
  - a **Banking Supervision Department** to supervise the banking system;
- The Law sets the monetary functions and operations of the BNB in accordance with the general principles of operation of a currency board.

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## The CBA in Bulgaria versus an Orthodox CBA

### Common key features:

| An Orthodox Currency Board   | The CBA in Bulgaria |
|--|---------------------|
| Maintains full foreign exchange cover for its note, coin and deposit liabilities as set by law |                     |
| Maintains a truly fixed exchange rate with respect to the reserve currency as set by law       |                     |
| Cannot finance domestic government spending as set by law                                      |                     |

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## The CBA in Bulgaria versus an Orthodox CBA

### Main differences:

| An Orthodox Currency Board                             | The CBA in Bulgaria   |
|--|---|
| Usually supplies only notes and coins                  | Supplies notes, coins and deposits as well  |
| Does not regulate commercial banks                     | Regulates commercial banks  |
| Is not a lender of last resort                         | Strictly limited lender of last resort  |
| Earns all seigniorage only from interest on its assets | Earns almost all seigniorage only from interest   |
| Full convertibility (both current and capital account) | Full current account convertibility but still restricted capital account convertibility (due to be changed) |

The CBA in Bulgaria is more flexible mainly because of the problems in the banking system before its adoption

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## The CBA in Bulgaria versus an Orthodox CBA

### Equal advantages:

| An Orthodox Currency Board         | The CBA in Bulgaria |
|------------------------------------|---------------------|
| Transparency                       |                     |
| Rapid monetary reform              |                     |
| Rule-bound monetary policy         |                     |
| Protection from political pressure |                     |
| Cannot create inflation            |                     |
| High credibility                   |                     |

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## Monetary Policy Tools

### 1. Reserve Requirements

#### Subject to Regulation No. 21 on the Minimum Required Reserves according to Article 41 of the Law on the BNB:

- 11 percent of banks' deposit base;
- both in Bulgarian leva and foreign currency;
- averaged on a monthly basis but banks have to pay interest for the excess over the 50 percent for each day of use;
- the BNB may decide to pay interest on the lev component.

#### Comments on consistency with currency board rules:

- reserve requirements are a tax on the banking system, which is absent in an orthodox currency board;
- the option to change the level of requirements should not be used;
- the option to remunerate reserves should be used as soon as possible;
- the most radical solution is to eliminate reserve requirements, leave the banks themselves to determine the amount of reserves held with the BNB for settlement purposes and make reserves fully remunerated.

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## Monetary Policy Tools

### 2. Lender of Last Resort (LLR)

**Subject to Regulation No. 6 on Extending Collateralized Loans to Banks as set by Articles 19 and 33 of the Law on the BNB:**

- only in the event of a liquidity risk and against collateral of liquid assets;
- only up to the amount of available funds on the Banking Department deposit placed with the Issue Department;
- only as short term support up to 30 days and renewed no more than twice;
- liquidity risk is determined by the delays of settlement transactions in the Banking Integrated System for Electronic Transfer (BISERA).

**Comments on consistency with currency board rules:**

- knowing the fragile stability of the banking system in Bulgaria it is reasonable that a strictly limited LLR function has been left;
- in the case of Bulgaria the LLR function has only contributed to the credibility of the currency board arrangement.

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## Monetary Policy Tools

### 3. Open Market Operations (OMO)

**The Law on the BNB prohibits OMO, since the BNB may not extend credits in whatever form to the State.**

**However, the Ministry of Finance has some room for OMO:**

- the BNB acts as **an agent** for government and government guaranteed debt;
- all auctions are organized by the Fiscal Services Department of the BNB;
- all transactions are registered by the Fiscal Services Department of the BNB;
- the Ministry of Finance provides the necessary funds for the redemption of the government securities no later than one working day prior to redemption;
- reverse repurchase of government securities prior to maturity is allowed by a decision of the Minister of Finance.

**Comments on consistency with currency board rules:**

- the lack of OMO for the BNB is in line with orthodox currency board rules;
- the Ministry of Finance is able to use OMO only due to the presence of the government deposit in the liabilities of the Issue Department.

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## Monetary Policy Tools

### 4. Base Interest Rate

#### Subject to Article 35 of the Law on the BNB:

- the BNB is obliged to announce (not to set!) the base interest rate;
- the Managing Board has the right to determine the method to be used;
- currently the base interest rate is announced as the average yield on three-month government treasury bills after each auction held by the Fiscal Services Department in the primary market.

#### Comments on consistency with currency board rules:

- currently the market is distorted in two major respects:
  - to minimize its costs the Ministry of Finance is interested in deliberately forcing the yield down by reducing supply of treasury bills;
  - interbank rates may be influenced by the base rate if banks use it as a benchmark
- in a fixed exchange rate regime the market alone should determine interest rates;
- hence, at least the method of announcement should be changed (e.g. LIBOR).

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## Monetary Policy Tools

### 5. Commissions

#### Subject to Articles 29 and 30 of the Law on the BNB:

- the official exchange rate is set at BGL 1,000 per DEM 1 (and the corresponding rate to the Euro when it becomes legal tender in Germany);
- the BNB is obliged to exchange reserve currency against levs on the basis of spot exchange rates, which cannot depart from the official exchange rate by more than 0.5 percent, inclusive any fees and commissions;
- the Managing Board has decided to sell Deutschemarks at BGL 1,000 per DEM 1 and buy at BGL 995 per DEM 1.

#### Comments on consistency with currency board rules:

- commission fees are supposed to worsen the link to the reserve currency;
- however, permanent low commission fees discourage short-term arbitrageurs;
- any change of commission fees would affect short-term capital movements;
- the market has already adjusted and it seems best to avoid any changes;

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## Monetary Policy Tools

### 6. Purchase of Gold

#### Subject to the old Law on Transactions in Foreign Exchange Valuables and Currency Control (now to be changed):

- producers offer the BNB to purchase gold extracted in Bulgaria;
- gold is included in the international foreign exchange reserves of the BNB;
- after the adoption of the CBA the amount of gold purchased by the BNB has substantially decreased.

#### Comments on consistency with currency board rules:

- such features are absent in an orthodox currency board;
- market forces alone should determine whether production of gold results in an increase of domestic currency in circulation (by exchanging gold against the reserve currency and converting it into domestic currency);
- if the BNB were allowed to both purchase and sell gold against Bulgarian levs, then gold could even play the role of domestic securities for OMO;
- hence, the right of the BNB to purchase gold against domestic currency should be abolished.

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## The Financial System under the CBA in Bulgaria

#### Three main layers:

1. The **Issue Department** and the **Banking Department** of the BNB;
2. **Commercial banks** (supervised by the Banking Supervision Department);
3. **The public** (together with the nonbanking financial institutions);

#### The Government is another special participant:

- it keeps its funds deposited with the Issue Department of the BNB;
- it organizes the market for government securities through the Fiscal Services Department of the BNB and services the domestic government debt;
- it borrows from the IMF and other international financial institutions and services the foreign government debt;
- it collects taxes and spends on salaries, pensions, subsidies, etc. in the budgetary sector;
- it also receives part of the seigniorage earned by the BNB.

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## The Financial System under the CBA in Bulgaria: Balance Sheets

| Issue Department |                  | Banking Department               |                         | Commercial Banks                           |                            | Public                                |          |
|------------------|------------------|----------------------------------|-------------------------|--|----------------------------|---------------------------------------|----------|
| FX               | C<br>R<br>G<br>B | B<br>L <sup>d</sup><br>RG<br>... | L <sup>IMF</sup><br>... | C<br>R<br>L<br>S<br>FX <sup>B</sup><br>... | D<br>L <sup>d</sup><br>... | C<br>D<br>S<br>FX <sup>P</sup><br>... | L<br>... |

### Main balance sheet items:

- FX – foreign exchange reserves (as set by Article 28 of the Law on the BNB);  
 C – currency in circulation;  
 R – reserves of commercial banks;  
 G – the government deposit with the Issue Department;  
 B – the Banking Department deposit with the Issue Department;  
 L<sup>d</sup> – discount loans extended according to the strictly limited LLR function;  
 RG – receivables from government (due to borrowings from the IMF);  
 L<sup>IMF</sup> – borrowings from the IMF;  
 L – loans extended to the public by commercial banks;  
 D – deposits of the public with commercial banks;  
 S – domestic government securities;  
 ... – other unimportant items.

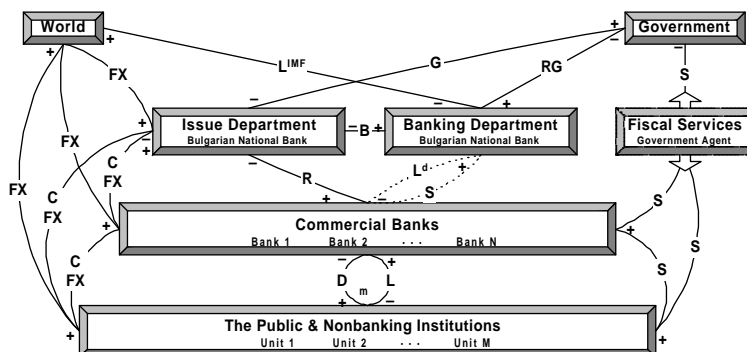
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## The Financial System under the CBA in Bulgaria: Flow Channels



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## The Financial System under the CBA in Bulgaria: Money Supply

Let  $M^b$  be the monetary base,  $M$  - the money supply and  $m$  - the standard money multiplier. Then,

$$M^b = C + R = FX - G - B$$

$$M = m \cdot [FX - G - B]$$

### Conclusions:

- *ceteris paribus*, changes in  $FX$ , which are not related to equal changes in  $B$  or  $G$ , proportionally cause identical changes in the money supply  $M$  (c.f. the rule-bound money supply in an orthodox currency board);
- *ceteris paribus*, changes in  $B$ , which are not related to equal changes in  $FX$ , proportionally cause inverse changes in the money supply  $M$  (e.g. LLR);
- *ceteris paribus*, changes in  $G$ , which are not related to equal changes in  $FX$ , proportionally cause inverse changes in the money supply  $M$  (i.e. the Ministry of Finance, wittingly or not, conducts monetary policy operations by controlling domestic inflows to and outflows from its funds  $G$ ).

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## The Financial System under the CBA in Bulgaria: The Government Deposit

- **The two extreme cases of investing all government funds abroad or investing them in the domestic market are dual:**
  - if all funds are invested abroad, then budgetary operations in the domestic market cause changes in money supply, while such operations in the international markets (e.g. foreign debt operations) do not affect it;
  - if all funds are invested in the domestic market (which is possible only theoretically), then domestic budgetary operations do not affect money supply, while international operations cause changes;
- **Any mixture between the two extreme cases is equivalent to giving somebody else the power to affect the money supply in a discretionary manner;**
- **Hence, the least dangerous solution for the stability of the financial system is to keep the funds of the government deposited with the Issue Department (at least until an efficient financial market develops in Bulgaria).**

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## The Role of Reserve Management Operations

- **Main objectives of reserve management operations (Law):**
  - to guarantee full foreign exchange cover for the monetary liabilities of the Issue Department with high-quality foreign assets;
  - to guarantee unconstrained exchange of domestic currency against reserve currency;
  - to guarantee an annual excess of revenue over expenditure;
- **Main restrictions on reserve management operations (Law):**
  - all convertible foreign currencies are permitted because of the liabilities:
    - the government deposit contains accounts in several foreign currencies;
    - reserves of commercial banks are also allowed to be in foreign currencies;
    - monetary gold is also included in the foreign exchange reserves;
  - the currency mismatch in the balance sheet for any foreign currency other than the Deutschmark should not be higher than two percent;
  - permissible holdings are gold, notes and coins, funds on accounts with foreign central banks or institutions, debt instruments and repurchase agreements, whereof obligations should be assigned one of the two highest ratings by two international rating agencies.

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## The Role of Reserve Management Operations

- **Main risks of reserve management operations:**
  - credit risk: default losses eliminated due to highest possible ratings;
  - market risk:
    - currency risk: potential losses strictly limited, because of the strictly limited currency mismatch in the balance sheet (gold price could not fall that much!)
    - interest rate risk: potential losses unlimited (at least in theory);
  - other risks (e.g. operational): potential losses assumed to be zero;
- **Any negative change in the market value of the assets leads to an equal negative change in the excess cover for the monetary liabilities of the Issue Department, which is measured by the size of the Banking Department Deposit (B):**
- **It is appropriate to apply an A/L approach in order to distinguish between (and measure separately) the effects of all the different factors that cause changes to B**

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## The Role of Reserve Management Operations: The Banking Department Deposit

| Issue Department (at Time T) |                 | Issue Department (at Time T+ΔT)               |   |
|------------------------------|-----------------|---|---|
| $A_1 \cdot e_1$              | $B$             | $[A_1 + \Delta A_1] \cdot [e_1 + \Delta e_1]$ | $B + \Delta B$                                |
| $A_2 \cdot e_2$              | $L_1 \cdot e_1$ | $[A_2 + \Delta A_2] \cdot [e_2 + \Delta e_2]$ | $[L_1 + \Delta L_1] \cdot [e_1 + \Delta e_1]$ |
| ...                          | $L_2 \cdot e_2$ | ...   | $[L_2 + \Delta L_2] \cdot [e_2 + \Delta e_2]$ |
| $A_n \cdot e_n$              | ...             | $[A_n + \Delta A_n] \cdot [e_n + \Delta e_n]$ | ...   |
|                              | $L_n \cdot e_n$ | $[L_n + \Delta L_n] \cdot [e_n + \Delta e_n]$ |   |

### Currency Structure of the Balance Sheet of the Issue Department:

- $i = 1, 2, \dots, n$  – currency number (BGL, EUR, USD, JPY, CHF, XAU,...);
- $A_i$  – the amount of assets in currency number  $i$ ;
- $L_i$  – the amount of liabilities in currency number  $i$ ;
- $e_i$  – the exchange rate of currency number  $i$  against the Bulgarian lev;
- $B$  – size of the Banking Department Deposit;
- $\Delta^*$  – change of variable  $*$  from time  $T$  to time  $T+\Delta T$ .

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## The Role of Reserve Management Operations: The Banking Department Deposit

Let us define the average amounts of assets and liabilities and the average exchange rates for the time period  $[T, T+\Delta T]$  as:

$$\bar{A}_i = 0.5 \cdot [A_i + (A_i + \Delta A_i)]$$

$$\bar{L}_i = 0.5 \cdot [L_i + (L_i + \Delta L_i)]$$

$$\bar{e}_i = 0.5 \cdot [e_i + (e_i + \Delta e_i)]$$

Then the change in the size of the Banking Department deposit can be attributed to exchange rate effect and volume effect as:

$$\Delta B = \sum_i \{ [\bar{A}_i - \bar{L}_i] \cdot \Delta e_i + [\Delta A_i - \Delta L_i] \cdot \bar{e}_i \}$$

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## The Role of Reserve Management Operations: The Banking Department Deposit

| Issue Department (at Time T+ΔT)  |  |
|--|--|
| $[A_1 + (\Delta A_1 - ACF_1) + ACF_1] \cdot [e_1 + \Delta e_1]$<br>$[A_2 + (\Delta A_2 - ACF_2) + ACF_2] \cdot [e_2 + \Delta e_2]$<br>$\dots$<br>$[A_n + (\Delta A_n - ACF_n) + ACF_n] \cdot [e_n + \Delta e_n]$ | $B + \Delta B$<br>$[L_1 + (\Delta L_1 - LCF_1) + LCF_1] \cdot [e_1 + \Delta e_1]$<br>$[L_2 + (\Delta L_2 - LCF_2) + LCF_2] \cdot [e_2 + \Delta e_2]$<br>$\dots$<br>$[L_n + (\Delta L_n - LCF_n) + LCF_n] \cdot [e_n + \Delta e_n]$ |

Let  $ACF_i$  be the net inflow/outflow of currency  $i$  on the asset side and  $LCF_i$  be the net inflow/outflow on the liability side. Then the change in volume can be separated into a change in market value plus an external inflow/outflow as follows :

$$\Delta A_i = (\Delta A_i - ACF_i) + ACF_i$$

$$\Delta L_i = (\Delta L_i - LCF_i) + LCF_i$$

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## The Role of Reserve Management Operations: The Banking Department Deposit

Thus, the change in the Banking Department Deposit can be further split into: exchange rate effect, assets market value effect, liabilities market value effect, and inflow/outflow effect as:

$$\Delta B = \sum_i \{ [\bar{A}_i - \bar{L}_i] \cdot \Delta e_i + [\Delta A_i - ACF_i] \cdot \bar{e}_i - [\Delta L_i - LCF_i] \cdot \bar{e}_i + [ACF_i - LCF_i] \cdot \bar{e}_i \}$$

$$\Rightarrow \sum_i [\bar{A}_i - \bar{L}_i] \cdot \Delta e_i \text{ is the exchange rate effect;}$$

$$\Rightarrow \sum_i [\Delta A_i - ACF_i] \cdot \bar{e}_i \text{ is the assets market value effect;}$$

$$\Rightarrow \sum_i [\Delta L_i - LCF_i] \cdot \bar{e}_i \text{ is the liabilities market value effect;}$$

$$\Rightarrow \sum_i [ACF_i - LCF_i] \cdot \bar{e}_i \text{ is the inflow/outflow effect.}$$

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## The Role of Reserve Management Operations: The Banking Department Deposit

**The final step is to split the inflow/outflow effect by noting that it can be generated in the following ways:**

- as a result of asset inflows and outflows (part of  $ACF_i$ ), which are not matched by equal liability inflows and outflows (part of  $LCF_i$ ). In this group fall the net operating and investment costs of the bank paid in foreign currency (e.g. expenditure on equipment, income from commission fees, etc.) and also any net borrowings from the IMF, which have remained unutilized by the government in order to provide support for the CBA;
- as a result of liability inflows and outflows (part of  $LCF_i$ ), which are not matched by equal asset inflows and outflows (part of  $ACF_i$ ). In this group fall the net operating and investment costs of the bank paid in domestic currency (e.g. expenditure on salaries and office supplies, income from service fees) and also the net amount of discount loans extended to commercial banks according to the LLR function of the Banking Department.

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## The Role of Reserve Management Operations: The Banking Department Deposit

**The final decomposition into different factors of the change in the size of the Banking Department deposit is given by the following fundamental equation:**

$$\Delta B = \left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{Assets Market} \\ \text{Value Effect} \end{array} \right] - \left[ \begin{array}{c} \text{Liabilities Market} \\ \text{Value Effect} \end{array} \right] - \left[ \begin{array}{c} \text{BNB Operating and} \\ \text{Investment Costs Net} \end{array} \right] - \left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right] + \left[ \begin{array}{c} \text{IMF} \\ \text{Net} \end{array} \right]$$

**It gives the exact relationship between all the different factors that affect the size of the Banking Department deposit (i.e. the stability of the CBA) and can be used for three main purposes:**

- 1 To check the future stability of the CBA in Bulgaria by performing scenario simulations for all factors (including worst case scenario);
- 2 To impose limits on the magnitude of one factor by setting the expected magnitude of the others (i.e. risk management);
- 3 To explain changes in the size of the Banking Department deposit in subsequent balance sheets of the Issue Department by measuring the magnitude of each separate factor.

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### The Role of Reserve Management Operations: Full Foreign Exchange Cover

- Ideally, the stability of the CBA should be achieved without external support, i.e. the IMF net effect should remain zero;
- Let  $Z \geq 0$  be the critical size of B, threatening the CBA stability;
- Then, even in a worst case scenario, the following conditions should be satisfied:

$$\Delta B = \left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{AssetsMarket} \\ \text{Value Effect} \end{array} \right] - \left[ \begin{array}{c} \text{LiabilitiesMarket} \\ \text{Value Effect} \end{array} \right] - \left[ \begin{array}{c} \text{BNB Operating and} \\ \text{Investment Costs Net} \end{array} \right] - \left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right]$$

$$\Delta B \geq Z - B \geq -B$$

- Thus, the four types of expenses have to share the permitted amount of change  $Z - B$  even in a worst case scenario.

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### The Role of Reserve Management Operations: Full Foreign Exchange Cover

- Let  $H > 0$  be a projection of the magnitude of both the liabilities market value effect and the operating costs net effect from time T to time T+  $\Delta T$ ;
- Then, the maximum amount available for LLR in a worst case scenario depends on the maximum value that has been put at risk for reserve management purposes:

$$\left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right] \leq B - Z + \left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{AssetsMarket} \\ \text{Value Effect} \end{array} \right] - H$$

- Conversely, if there is a certain lower limit on the funds that should always be available for LLR then the maximum value to be put at risk for reserve management purposes is limited:

$$\left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{AssetsMarket} \\ \text{Value Effect} \end{array} \right] \geq Z - B + H + \left[ \begin{array}{c} \text{LLR} \\ \text{Net} \end{array} \right]$$

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## The Role of Reserve Management Operations: Full Foreign Exchange Cover

- The maximum value that can be put at risk for reserve management purposes depends on the desired minimum amount of funds, available for LLR, the projected liabilities remuneration and BNB operating and investment costs (H), the size of the Banking Department deposit (B) and its minimum credibility level (Z):
- Under certain assumptions about the worst case exchange rate effect, the permissible worst case asset market value effect can be estimated, i.e. a limit on the permissible interest rate risk of the foreign exchange reserves can be computed:
- Reserve management operations should be based primarily on strong risk management techniques:
- Absolute measures of risk should be applied (such as dollar duration) rather than relative measures (such as duration);
- Worst case scenarios should be simulated (rather than VaR).

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## The Role of Reserve Management Operations: Unconstrained Exchange of Reserve Currency

- Reserves would be structured in a rather inefficient way if temporary unrealized losses have to be realized in order to meet obligations of the CBA under normal circumstances in the domestic market ( liquidity risk );
- Liquidity risk should be strictly limited by applying adequate maturity constraints on the structure of reserves;
- The obligations of the CBA should be carefully analyzed:
  - domestic currency in circulation:
    - the so-called 'hard core' should be estimated
    - the maximum amount that could be exchanged against reserve currency in a short period of time (in a worst case domestic scenario) should be estimated
  - the government deposit:
    - different funds could be managed more efficiently as separate portfolios
    - it should be kept in mind that the assets covering the government funds put at risk part of the size of B according to the derived fundamental equation so that less could be put at risk for efficient management of the other assets
  - reserves of commercial banks:

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### The Role of Reserve Management Operations: Minimum Level of Revenue

- Over an investment horizon of one year revenue should exceed total BNB expenses, i.e.  $\Delta B \geq 0$  in a year;
- If we assume that the net LLR effect over the year is zero, then from the fundamental equation it follows:

$$\left[ \begin{array}{c} \text{Exchange} \\ \text{Rate Effect} \end{array} \right] + \left[ \begin{array}{c} \text{AssetsMarket} \\ \text{Value Effect} \end{array} \right] \geq \left[ \begin{array}{c} \text{Liabilities Market} \\ \text{Value Effect} \end{array} \right] + \left[ \begin{array}{c} \text{BNB Operating and} \\ \text{InvestmentCosts Net} \end{array} \right] \geq H$$

- Therefore, a certain minimum target level of return (depending on the size of reserves) should be achieved with a very high probability (e.g. 95 percent);
- Under certain assumptions about the worst case exchange rate effect the derived inequality implicitly imposes a second upper limit on interest rate risk of foreign exchange reserves (as the ‘full cover’ objective has already done so).

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### The Role of Reserve Management Operations: Benchmark Construction

- In order to achieve the three main objectives of reserve management, the Treasury Directorate of the BNB has developed an appropriate method for strategic asset allocation and benchmark construction;
- The method is consistent with the described strategic issues;
- It is interesting to note that, for the time being, the first limit on interest rate risk (the one imposed by the ‘full cover’ requirement) is slack: with the current size of reserves it is less constraining than the one imposed by the ‘minimum level of revenue’ requirement;
- Thus, the foreign exchange reserves of the BNB have been structured according to a benchmark, which guarantees the stability of the CBA in Bulgaria even in worst case scenarios.

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## SUMMARY

- We have reviewed the reasons to adopt the CBA in Bulgaria;
- We have compared it with an orthodox CBA;
- We have examined the main tools of monetary policy operations for consistency with orthodox CBA rules;
- We have presented the flow channels and balance sheets in the financial system under the CBA in Bulgaria;
- We have examined the money supply process and explained the peculiarities in the design of the CBA in Bulgaria;
- We have derived an equation for the interrelationship between the factors affecting the stability of the CBA;
- We have analyzed the role of reserve management operations in the functioning of the CBA in Bulgaria.

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## References

- Avramov, R.** (1999) The Role of a Currency Board in Financial Crises: The Case of Bulgaria. *BNB Discussion Papers*, No. 6.
- Balino, J.T., C. Enoch** (1997) Currency Board Arrangements: Issues and Experiences. *Washington IMF Occasional Paper No. 151*.
- Hanke, S., K. Schuler** (1994) Currency Boards for Developing Countries. ICS Press. San Francisco.
- Enoch, C., A. Gulde** (1997) Making a Currency Board Operational. *Washington IMF Paper on Policy Analysis and Assessment* 97/10.
- Gray, S., G. Hoggarth** (1996) Introduction to Monetary Operations. *Bank of England Handbooks in Central Banking*, No. 10.
- Gulde, A.** (1999) The Role of the Currency Board in Bulgaria's Stabilization. *Washington IMF Policy Discussion Paper* 99/3.
- Latter, T.** (1996) The Choice of Exchange Rate Regime. *Bank of England Handbooks in Central Banking*, No. 2.
- Minassian, G., M. Nenova, V. Yotzov** (1998) The Currency Board in Bulgaria. GorexPress, S. (in Bulgarian).
- Mishkin, F.** (1992) The Economics of Money, Banking and Financial Markets. Third Edition. Harper Collins Publishers. New York.
- Nenovsky, N., K. Hristov** (1998) Financial Repression and Credit Rationing under Currency Board Arrangement for Bulgaria. *BNB Discussion Papers*, No. 2.
- Nenovsky, N., K. Hristov, B. Petrov** (1999) Two Approaches to Fixed Exchange Rate Crises. *BNB Discussion Papers*, No. 4.
- Osband, K., D. Villanueva** (1992) Independent Currency Authorities: An Analytic Primer. *Washington IMF Working Papers*, vol. 40, No. 1, pp. 202 – 216.
- Schwartz, A.** (1993) Currency Boards: Their Past, Present and Possible Future Role. Carnegie-Rochester Conference Series on Public Policy 39, North-Holland, pp. 147 – 187.
- Yotzov, V., N. Nenovsky, K. Hristov, I. Petrova, B. Petrov** (1998) The First Year of the Currency Board in Bulgaria. *BNB Discussion Papers*, No. 1.

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