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Specificities of the Monetary Transmission Mechanism within the Bulgarian Currency Board Framework: The first five years

Abstract: This paper presents an overview of the channels of monetary transmission and their manifestation in Bulgaria – a country in a currency board arrangement – in the first five years after the introduction of the regime. The presence of such a mechanism of transmission requires some form of macroeconomic discretion. The latter is approximated here with dynamics in the single fiscal account present on the balance sheet of the currency board.

Keywords: monetary transmission, currency board, Bulgaria.

JEL Classification: E42, E52.

1. Introduction

In early 1997, after negotiations with the IMF, the recently elected government of Bulgaria at the time decided to introduce a currency board regime in the country. This was seen as a bitter but necessary pill for the treatment of the banking crisis and the rampant inflation, which made Bulgaria`s economic prospects look very sombre. After the board began to function on July 1, 1997, there was a rapid stabilisation of the Bulgarian macroeconomic environment. This was a necessary prerequisite for achieving positive growth levels and it made the start of the privatisation process possible. But some economists feared (and some do so even now – end of 2003) that the currency board deprived Bulgaria of an ad-

ditional possible source of growth – active management of monetary policy. It is beyond the scope of this paper to investigate the merit behind such fears, especially in light of the numerous statistics and research showing that the currency board was and continues to be a well- functioning and beneficial macroeconomic choice for Bulgaria.[1] The paper, however, points to certain possibilities of conduct of macroeconomic policy and a resulting monetary transmission mechanism. This, though, is not really fresh news, and so it is not the major contribution of this research. Rather, its aim is to investigate how an unorthodox form of monetary policy transmits through its different channels to the real sector of an unorthodox environment (a transition country in a currency board reviving from a costly financial crisis and building market institutions at the same time). For this purpose, we will use the following structure: the next section will discuss possible monetary policy instruments under the currency board and their dependency on fiscal policy in the Bulgarian case; the third section will deal with the different channels of monetary transmission (having already established its presence) and the Bulgarian specificities that should influence their relative strength; a couple of VAR models will follow that empirically test the effects and magnitude of some of those channels; possible implications are left for the conclusion.

2. Monetary policy in a currency board regime

2.1. Some thoughts on monetary policy

The conduct of fiscal and monetary policy by a government and a central bank, respectively are the two common means to intervene actively in the business cycle. But while the fiscal policy concerns the collection of taxes and government spending, and thus has straightforward implications to the formation of national income, the monetary policy deals with financial variables whose effects on the real sector are indirect and therefore more difficult to predict. Furthermore, the division of the macroeconomic management into fiscal and monetary that we now accept as given has not always been defined this way. Paul Volcker, a former chairman of the US Federal Reserve System, recollects that as late as the mid-1950s debt management was practically considered a "third leg" of active policy. (Volcker, 2002) But while this third branch has long been incorporated into the other two, monetary policy has preserved its distinctive place as an active tool in the economy. Why is it so?

[1] See Zaimov and Hristov (2002) for an excellent overview of the board's performance.

Ideally, a successful monetary policy would minimize short-term fluctuations in output. What markets need to function well are rules that are respected and, put more generally, predictability. A successful monetary policy ensures predictability. But experience and the numerous volumes of research show that it is very difficult to predict how the subtle play with relative prices (which monetary policy actions represent) can be effective in influencing the targeted real variables at the desired magnitude. That is why a central bank usually has at its disposal a variety of tools to conduct macroeconomic policy. Some of them can have a more permanent impact on the financial system as a whole, and are normally used more sparingly or less frequently. These include setting up the level of minimal required reserves, changing the discount rate (the interest rate at which the central bank lends to commercial banks), etc. On the other hand, open market operations are used every day to impact the monetary base directly and in a much shorter period of time. Irrespective of the tool used, however, they eventually create the same incentives that are transferred to the real sector through the same set of paths, known under the common heading "monetary transmission mechanism". But before discussing this mechanism more thoroughly, a better understanding of the interaction between fiscal and monetary policy is required.

2.2. The interplay of monetary and fiscal policy

The conduct of monetary policy even without legislative or other restrictions such as a currency board, a fixed peg, a managed float, etc. is in a way shaped by fiscal dynamics. As Zaimov and Hristov (2002) put it, "the core of monetary policy is to manage the government debt portfolio issued to finance the budget deficit", and this includes the exchange of interest bearing securities such as government bonds for non-bearing ones (currency) and the other way around. While this does not contradict the strategic purpose of a central bank to pursue for example price stability, it sets limits to what the monetary authority could do. The latter cannot control the absolute size of public or foreign debt, but only the relative shares of its bond and currency denominations. A huge fiscal deficit or high debt/GDP ratios will leave a central bank with little possibilities for manoeuvre, making it *de facto* dependent on the political authorities. In this light, the main virtue of a currency board regime represents a "clear statement by the government that it will not finance its expenditures by credit from the central bank." (Zaimov and Hristov) In other words, this is a legal commitment that the government will not monetise (parts of) its debt – something that should both make it more responsible in the management of its debt and deficit and should isolate the central bank from its pressures. As we will see later, though, the link between fiscal and monetary policy is not completely severed with the introduc-

tion of a currency board in Bulgaria, and fiscal authorities play an important role in the monetary transmission there.

2.3. Monetary transmission in a currency board regime?

In the paper titled "The new currency boards and discretion: empirical evidence from Bulgaria", Hristov and Nenovsky and Mihaylov (2001) distinguish two types of currency boards. The orthodox or colonial type excludes any kind of monetary discretion. The automation mechanism to correct for short-term disequilibria "is backed by a simple and clear rule, which determines the relationship between BOPs, money supply and interest rate dynamics."[2] In such circumstances, there cannot be autonomous monetary transmission apart from the one diffused from the colonial power and created by the latter's monetary discretion.

Present-day currency boards, however, are introduced in sovereign states, and the specific designs of those boards reflect this fact. Most countries that have recently entered such arrangements aim to import credibility to their central banks, often following a period of hyperinflation. In theory, this still means they are adopting the monetary policy of the country of the reserve currency. But in practice, the design of these second-generation currency boards always leaves room for some domestic monetary discretion.

In Estonia, for example, despite the strong legal commitment to and rigorous institutional framework of the currency board, the central bank can still perform the lender of last resort functions (same as in Bulgaria – see below). It also issues certificates of deposit (CDs), and changes reserve requirements on a regular basis – 13 times in the period between June 1992 and the beginning of 2001. (Nenovsky, Hristov and Mihaylov (2001) All of these represent tools for discretion that the monetary authority can and does use when it finds necessary. Lithuania is another illustration where monetary discretion in a currency board is even more pronounced. Apart from the lender of last resort functions and short-term crediting to commercial banks, the Central Bank of Lithuania can also perform repo operations with treasury bills and auctions for time deposits. The presence of the government fiscal reserves on the liability side of the central bank is another deviation from orthodox currency boards (see the Bulgarian case). As Nenovsky, Hristov and Mihaylov indicate, all of these instruments of discretion reflect a three-stage program of gradual exit from the currency board arrangement conditional on long-term macroeconomic stability.

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[2] Hanke and Schuler as qtd. in Nenovsky, Hristov and Mihaylov (2001)

There is certainly a trade-off between discretion and credibility of a currency board regime, and the Argentinean experience makes the point. The compromises that allowed for monetary discretion there meant less commitment to credibility, which was partly what led the country down the slippery road of bank panic and a run on the currency. Experience has therefore established the case for less discretion, even though the countries of transition that adopt currency board regimes need some form of macroeconomic liberty to help boost their growth rates. I now turn to the Bulgarian experience and the possibilities for discretion there.

2.4. Possible sources of monetary discretion in Bulgaria

The Bulgarian currency board was introduced on July 1, 1997. It is practically the balance sheet of one of the three pillars within the system of the Bulgarian National Bank (BNB) – the Issue Department (the other two being the Banking Department and Bank Supervision). To facilitate further discussion and better illustrate some points, we present an Issue Department`s balance sheet with actual numbers.[3]

ASSETS	thousand BGN	LIABILITIES	thousand BGN
Cash and nostro accounts in foreign currency	9,340,642	Currency in circulation	11,041,349
Monetary gold	2,733,958	Bank deposits and current accounts	10,488,013
Foreign securities	25,829,984	Government deposits and accounts	9,988,068
		Other depositors' accounts	641,743
		Banking Department deposit	5,775,411
ASSETS	37,904,584	LIABILITIES	37,904,584

To support the fixed exchange rate of the lev to the euro, the Issue Department participates in the domestic interbank FOREX market, compensating the daily net demand of commercial banks for foreign or domestic currency. It also invests in highly secure bonds issued by non-residents and denominated in euros. As a result, the department generates profit, part of which goes for the next-year fiscal budget, but another (usually small) part serves to increase the currency board net worth. Table above shows the Banking Department`s deposits on the

[3] Source: BNB web page www.bnb.bg. Data are from the weekly Issue Dep. balance sheet of 29/05/2015.

liability side. The net worth shows that the central bank is able to convert not a hundred, but 127% of reserve money into euros.[4] This serves not only to boost the credibility of the board in the face of asset value volatility, but also as a means to perform the lender of last resort functions. The possibility of discretion is limited by regulations as to what constitutes a liquidity risk for the banking system and which banks (in terms of size and volume of transactions) could actually receive loans from BNB[5], but these facts do not alter the point that the central bank could inject money in the economy. This, however, has not been done on a sizeable scale so far and thus should not be considered a source of monetary transmission.

Another tool that the BNB could use as a means to conduct monetary policy is its right to change the level of commercial banks' minimal required reserves and their reporting methodology. Thus, a lowering of the required reserves-to-deposits ratio would infuse money into the banking sector with a probable effect of reducing the market interest rate and increasing the loan supply. An appropriate change in the method of reporting bank reserves at the BNB will have a similar corollary. As indicated earlier, while the Estonian Central Bank has used this option extensively, it remains an awkward tool causing longer-term structural changes in the banking system. The Bulgarian National Bank has used it only once since the inception of the currency board – in July 2000 it lowered the minimum reserve requirement (MRR) from 11% to 8%. Yet, this act did not attempt to influence the money supply, but rather reflected a belief in the increased credibility of the currency board and a tendency to ease the banking sector and converge to the euro area levels of MRR.[6] For the case of Bulgaria, therefore, the option of a change in required reserves may be included as a dummy variable in any model, but not as a proxy for active monetary policy.

Still a third possibility of macroeconomic discretion provides the fact that government fiscal reserves are included as a liability in the board's balance sheet. As can be seen from the table above, as of the end of November 2003 they come to 39.2% of Issue Department's total assets. The level of the government deposit depends on budget revenues and spending, revenue from privatisation, debt servicing, and loan tranches mostly from the IMF. The consequence of this arrangement is that the government and its agencies can put in and withdraw liquidity from the economy, and such dynamics effectively constitute a conduct of monetary policy, whether intentional or not. In support of this conclusion is

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[4] On the balance sheet shown, Banking Dep. deposit = 27.1% (currency in circ.+ commercial banks' reserves)

[5] For details see Nenovsky, Hristov and Mihaylov (2001).

[6] Ibid. (17)

the empirical finding that the link between the balance of payments and reserve money, which is automatically restored from short-term disequilibria under orthodox currency boards (and also in the case of Estonia), is broken in the Bulgarian case. There, long-run equilibrium is achieved when a vector of discretion is included, representing dynamics in fiscal reserves as they appear on the BNB balance sheet.[7] This result makes the single fiscal account a good proxy for macroeconomic discretion, something I use in the models further below.

3. Channels of monetary policy

3.1.1. The interest rate channel

The view that this is the main channel of monetary transmission seems a consensual one. There are somewhat different approaches to explaining it[8] but the basic assumptions are that the central bank manipulates the nominal interest rate (whether through a change in the monetary base or via the discount rate), and that there is at least some price rigidity. Then, the adjustment of the short-term nominal interest rate transfers to a change in the same direction of the real interest rate, and consequently, of the user cost of capital. As an example, a monetary tightening will push both the nominal and real interest rates up, increasing the user cost of capital. The result will be the postponement of investment decisions and the lowering of current consumption due to intertemporal substitution, meaning a temporary fall in output. There is evidence, however, that the effect on consumption is not very pronounced. A 1995 paper by Bernanke and Gertler,[9] for example, indicates that in the USA consumption spending is rather insensitive to interest rates. We may thus conclude that a country-specific intertemporal discount factor and marginal propensity of current consumption might lead to cross-country differences in the relative strength of the interest rate channel. Other disparities may depend on the availability in the economy of substitutes for traditional money, with a more muted interest rate channel in countries with more developed such instruments.[10]

It is also important to mention here that the paramount role that expectations play in today's markets has left its mark on the monetary transmission as a whole.

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[7] See ibid.

[8] See Kuttner and Mosser (2002) for one and Nualtaranee (1999) for another.

[9] As quoted in Nualtaranee (1).

[10] This is a speculative, not empirical conclusion.

Speaking concretely of interest rates, a central bank should in theory be able to influence mainly short- term rates, and only marginally long-term ones. But as Nualtaranee (1999) observes, "it is puzzling that monetary policy apparently has large effects on purchases of long-lived assets which respond to real long-term rates." This is most likely a result of expectations formation, and it carries implications for other channels of the monetary transmission as well.

3.1.2. The interest rate channel in the Bulgarian context

As mentioned above, the relative strength of this channel will partly depend on the development of domestic financial markets, e.g. the stock market. In Bulgaria, despite the spectacular growth of the SOFIX index in the past two years[11], the Bulgarian stock market is still pretty volatile, which undermines its credibility. As an illustration, the market capitalisation of all listed companies in 2001 is only about 5% of GDP. Part of the reasons behind this may be the slow privatisation process in certain sectors, which has yet to offer stocks from a number of state companies from the so-called "Dream Pool". Thus, few blue chips are offered on the stock market and this explains its small size and low liquidity. For the purpose of this paper, the corollary will be that investment in stocks will not be a substitute to deposits that would mute the effect of movements in the market interest rate. This implies a relatively stronger interest rate channel in Bulgaria.

Such a conclusion, however, may be undermined by a clear pattern during the last two to three years of diminishing interest rates on loans (both short- and long-term) and a reduction in the interest rate spread regardless of short-term fluctuations in reserve money. Such a tendency will impact the liquidity effect, a process that can roughly be equated with the manifestation of the interest rate channel, but only in case of a monetary expansion. The downward trend in interests on loans should actually intensify the liquidity effect, defined as "the purported statistical relation between expansion of bank reserves or monetary aggregates (or perhaps only surprise expansion of these aggregates) and short-run reductions in short- term interest rates." (Ohanian and Stockman, 1995) We would, therefore, expect asymmetries in the working of the interest rate channel, with its relative strength increasing with monetary expansions and decreasing with monetary contractions.

There are a number of reasons behind the convergence of the interest rates on loans and those on deposits (i.e. the interest rate spread) and they lie mainly in

[11] Capital. Aug 30-Sept 5, 2003 (p.36)

the banking sector. Processes taking place within the banking system, however, affect to a greater extent another channel of monetary transmission – the narrow credit channel, which will be discussed next.

3.2.1. The narrow credit channel

This path of the transmission mechanism is also largely known as the bank lending channel. It is fairly straightforward to explain: a monetary tightening reduces the volume of bank reserves, which limits banks' ability to give new loans. The result is a fall in aggregate spending and thus in output. While this seems logical and easy to grasp, there are numerous nuances and details to be considered.

Countries, for example, differ according to the role that loans play as a source of funds for investment. It can be generalized that in all Eurozone states bank financing is much more important to companies than is the case in the US. To illustrate, bank loans to the corporate sector average 45.2% of GDP in the euro area countries, but as little as 12.6% in the US, while stock market capitalization (again expressed as a percentage of GDP) is 193 for the latter as compared to 72 for Germany, and an average of 90 for the euro area (2001 data). (Ehrmann et al., 2001) On this basis and in line with previous discussion of the Bulgarian case, we may expect a much more pronounced bank lending channel in states with smaller relative importance of stock markets, and fewer or less developed alternative forms of finance in general.

There is much more to this, though. The relative strength and speed of the narrow credit channel will also depend on the period of maturity of loans. It is logical to expect that shorter maturity of bank loans (e.g. in Italy) will accelerate the monetary transmission because loan terms will react more frequently to new information from the monetary authority. Bank size may also be a factor, with smaller banks curtailing to a greater extent the amount of new loans following a monetary contraction. This would be a likely reaction within the Eurozone (esp. in Germany and Austria) where small banks generally depend a lot on one or a couple of big established customers, and it is their priority to serve those clients even if that is not the most profitable option at a given moment. As Ehrmann *et al.* (2001) indicate in their study on the euro area financial systems, due to this established practice of relationship lending, smaller banks have a strong incentive to "mute" reaction in lending behaviour. They can do this if they have higher degree of liquidity, liquidity provisions within bank networks or better relative capitalisation. The same study finds empirically that for the euro area countries only liquidity is statistically significant for banks' reaction to monetary policy,

while size and capitalization matter little. Differences in the level of liquidity across the national banking sectors in Europe are thus likely to lead to (slightly) different responses to the common macroeconomic policy of the ECB.

Yet another thing to consider here are lending standards, which according to some economists may affect the amount of issued loans more than the monetary stance. But accounting for and isolating the effect of those standards may prove almost impossible econometrically because of simultaneity problems that arise. In other words, bank lending standards cannot be viewed as strictly exogenous with respect to monetary policy shocks, because, for example, they tighten with a weakening of companies' balance sheets, which in turn may be a result of a contractionary monetary policy. This illustrates still another difficulty in measuring a "pure" credit channel.

3.2.2. Specificities of the Bulgarian banking sector

Cecchetti (1999) poses the question whether the impact of monetary policy varies across countries with the strength and scope of the banking system. One of his findings is, in particular, that the lending channel of monetary transmission depends on the banking system's health, concentration and importance as a source of finance. As noted earlier, the stock market in Bulgaria is not developed and the practice of companies issuing bonds is also not popular, so banks should be a very important source of private investment finance. But the financial crisis of late 1996-early 1997 curtailed severely banks' lending capacity and the financial institutions became very conservative and stringent in their lending practices, which led to a major credit crunch. Even in 2001, after four years of financial stability, bank loans to the private sector were only 14% of GDP.[12] A survey among Bulgarian companies ordered by the *Capital* newspaper shows that firms consider limited access to credit the third major obstacle to their development after the big taxation burden and frequent and haphazard legislative changes. And in 2002, only 1% of firms registered under VAT requirements used bank credit.[13]

The stated data should be put in a dynamic perspective though. Bank credit to private enterprises has been growing at a spectacular rate recently. It increased nominally by 46% in 1999, 40% in 2000, and 25% in 2001. (Zaimov and Hristov, 2002) In 2002, it was up to 18% of GDP (which is more than a 4pp increase from 2001 given growth of nominal GDP), while still below the 1995 figure. Such a

[12] Capital. May 31-June 6.

[13] Ibid.

trend should theoretically add to the strength of the bank-lending channel of the transmission mechanism.

While it is not the purpose of this paper to delve in the issue of the rapid credit growth, we will nevertheless devote a paragraph to it for it may have important implications to macroeconomic stability in Bulgaria. In addition to the reduction in the interest rate gap, banks have also eased their lending standards. These factors influenced the supply and demand for bank credit and tightened bank competition. Other reasons behind the increased loan supply are the rebounding in the deposit base of commercial banks after the financial crisis (33.2% of GDP in 2002[14]), the repatriation of Bulgarian banks' assets (because of a worldwide fall in interest rates) and the new Real-time Interbank Gross-Settlement System (RINGS), which reduces the daily funds necessary to service bank transactions from BGN 350-400mln to BGN 50-70mln.[15] On the demand side are the increased need of turnover cash and capital investment, and the rolling over of interfirm debt through bank credit. Decreasing interest rates have also brought about a boom in the demand of consumer and mortgage loans.[16]

The concern with the rapid expansion of bank credit is connected namely to the discussed narrow lending channel. An increase in the monetary base will further boost the supply of loans. This will push interests on loans further down, lessen the interest rate gap even more, and this may induce banks (esp. smaller ones) to invest in riskier assets. This is a very clear and present danger in light of current discussions to decentralise the fiscal reserve and invest part of it in commercial banks in search for a higher return. Such an attempt has actually been already done with BGN`s 185mln that were transferred from the single government account to commercial banks. Upon recommendation from the IMF, though, this money will be returned to the BNB once the deposits mature.[17] Both the Fund and the Central Bank firmly oppose such moves that constitute a large positive monetary shock and could, therefore, be very destabilising for the currency board.

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[14] Capital. May 31-Jun 6.

[15] BNB calculations – see ibid.

[16] Capital. Aug 30-Sept 5.

[17] Capital (2003)

3.3. The broad credit channel

While banks can spread the effects of this channel as well, it can also work through the issue of bonds and other sources of external finance. It goes like this: companies always need some form of collateral when they borrow externally. The value of this collateral (even if it is reputation) is determined by the value of assets of the firm. A monetary tightening will make the value of long-lived assets, and therefore of collateral, decline, and this in turn will increase the premium of external funding. Again the result will be decreased total spending and output (investment and consumption will go down). As the broad credit channel impacts not only the banking system but also financial markets as a whole, it has come to be known in the economic literature as financial accelerator.

With respect to Bulgaria, there is no need to repeat here how underdeveloped its financial markets still are. What should be emphasised is that the broad credit channel is impacted especially by the swift growth of bank mortgage loans, where collateral value plays a central part. While this market segment is still very concentrated – three banks holding 79.4% of the total amount of housing loans – more and more institutions seek to enter it, some even introducing mortgage bond emissions. As a result, the volume of those loans has grown 31% in the first 6 months of 2003.[18] But the fact is that this spectacular expansion is due to a very low starting level – as of July 2003, mortgage loans comprises 3.9% of commercial banks' credit portfolios.[19] The growth of that type of credit is therefore likely to continue regardless of the monetary stance, a conclusion working against a strong financial accelerator.

3.4. The exchange rate channel

Real effects of movements in the exchange rate will ultimately show up as a change in the volume of net exports. Thus, it is logical to assume that this channel will affect smaller open economies relatively more strongly. This path of transmission works via the uncovered interest rate parity. A contractionary monetary policy raising domestic interest rates will appreciate the home currency. Net exports will fall as a consequence, making aggregate demand shrink as well. A note of caution should be made, however. The effect of this channel will be highly influenced by different kinds of exchange rate pegs or managed flows that are in place.

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[18] Capital. Aug 30-Sept 5 (10-11).

[19] Ibid.

3.5. The wealth channel

Here the effect of an increase in interest rates on long-term real rates (discussed above) leads to a fall in the value of long-lived assets such as stocks, long-term bonds, and real estate. As these are part of households' resources, current consumption is assumed to fall. An empirical study by Ludvigson, Steindel, and Lettau (2005) using US data, however, shows that the effect of this channel is rather weak. A proposed explanation is that first, shocks on the federal funds rate affect asset values only in the very short term, and second, that the fall in the value of assets may reflect the same inflationary expectations that induced the raising of interest rates. This again points to the important role expectations play in today's financial markets.

4. A VAR Model of Monetary Transmission in Bulgaria (results provided in the accompanying Technical Appendix)

4.1. What is a vector autoregression (VAR) approach?

A vector autoregression is "a regression of some vector of variables Y_t on lags of this vector."[20] The lag is chosen on the basis of the data type (monthly, quarterly, etc.), and economic intuition. The advantage of this approach is that it does not require a division of the variables into dependent and independent. All of them are endogenous for the system, and this avoids the problem of simultaneous equations and of choosing a particular structural relationship. What a VAR requires is shock identification – the default shock is one standard deviation of a chosen variable. Statistical packages that estimate VAR models can present graphically the impulse response functions of the other variables, showing to what extent and for how long they are influenced by the shock.

4.2. Why is a VAR approach suitable for an analysis of the Bulgarian Currency board?

Despite the proliferation of VAR analyses in recent years, some authors have criticised the use of this approach. McCallum (1999), for example, points out that "analysis of the effects of the systematic part of policy requires structural modelling rather than VAR procedures, because the latter do not give rise to be-

[20] Proposed by Sims, qtd. in Boivin and Giannoni (2002)

havioural relationships that can plausibly be regarded as policy-invariant." This economist also cites empirical studies on the Bank of Japan, Bundesbank, and Federal Reserve reaction functions, which show that the unexplained instrument variance is tiny (at most 5%) compared to that explained by the systematic component of monetary policy conduct. However, McCallum states that central bank actions in expectation of business cycle evolutions should be considered a systematic response, and not representing a shock.

There are other inconveniences in using a VAR analysis as, for example, that "there is compelling evidence of parameter instability in monetary VARs." (Boivin and Giannoni (2002) Then why is such a model appropriate for an investigation of the currency board in Bulgaria? The answer is that, as pointed earlier, the Bulgarian central bank does not conduct standard macroeconomic policy. The BNB sets a base interest rate every four weeks, but it serves only as a reference, and does not necessarily reflect current market conditions, only medium term tendencies (for financial markets four weeks may actually be a long-term perspective). On the other hand, the quasi-monetary policy performed by the government through fiscal dynamics can be thought of as a series of shocks for the economy. To better illustrate this point, if Bulgaria receives a tranche from the IMF, the money appears on the balance sheet of the Banking Department. Then, if the government requests, part or the whole of it goes to its deposit in the Issue Department. But when and how much of this money enters the economy depends on when and how much of it the ministries and their agencies spend.

Another reason to use a VAR model is the simple observation that the government does not use fiscal spending and revenues to intentionally influence the real interest rate and asset prices. Thus we cannot establish a structural relationship in which fiscal reserves (assumed to be a proxy for macroeconomic discretion) are used to explain interest rate movements, as would be the case with a reaction function of a normal central bank.

4.3. The model

To account for the different channels of monetary transmission, I use monthly data of some macroeconomic aggregates:[21] the fiscal account at the BNB, monetary base (currency in circulation + bank reserves with the central bank), money supply (M1), spot interbank rate for leva at the end of each month, interest rate on short-term loans as appearing on the consolidated balance sheet of commercial

[21] Data are taken from the BNB web page.

banks, amount of new loans issued by commercial banks to the private sector and imports (goods & services). All the series are used in logarithmic form, and their time span is from January 1998 to September 2003. We have not included data from the second half of 1997 to allow for some adjustment to the currency board regime.

In line with the previous discussion, we use changes in the government deposit as a proxy to macroeconomic activity. Thus, a shock to this variable is transmitted to the other variables, and the significance of the parameters is indicative of the strength of the respective channels of monetary transmission, while the parameters' numeric values represent elasticities with respect to a change in the fiscal account. We use imports as a proxy for output, because monthly data on GDP are not available and using quarterly data would make the data sample too small. Also, it is widely accepted that for transition countries imports and output are highly positively correlated. For an empirical test of this assumption see Equation 1, which is a regression of GDP on imports using Bulgarian quarterly data. The coefficient of imports is very close to one and is highly significant. There is also no evidence of first order serial correlation ($DW^* = 1.725 > DWcr.$) In theory, changes in imports should be taken together with exchange rate movements. But adding real effective exchange rate as a second explanatory variable deteriorates the quality of the model (see Equation 2).

After these clarifications, a succession of VAR models is estimated, and the respective impulse response functions are presented graphically. This facilitates a visualisation of the magnitude and timing of the different transmission channels.

4.4. Results

As can be seen from the graph, there is presence of a liquidity effect, with the greatest fall of the interbank lending (or federal funds) rate occurring in the first three models in the fifth period. As discussed, this reduction in interest rate represents a major part of the monetary transmission mechanism and especially of the interest rate channel, and it is a major indication of the "real" effect of money. A further indication of this "real" effect is also the almost immediate rise in imports, which means an expansionary effect on output. Such reactions show that an increase of the fiscal deposit at the BNB works (with a small lag) as an expansionary monetary policy. An increase in the supply of loans around the third period supports such a conclusion.

At first glance, these results may seem puzzling. Is not an increase in the government deposit associated with a withdrawal of liquidity from the Bulgarian economy, therefore approximating an effect of monetary contraction? Not necessarily. Actually, the fiscal account has increased more than twofold along with a similar growth in the monetary base. The models presented here may be used to argue that the former caused to some extent the latter, adding to the effects that growth in GDP and moderate inflation have on reserve money. The sort of quasi-monetary policy resulting from fiscal dynamics has been "sponsored" by IMF loans and privatisation revenues, most of which represent foreign cash coming to the country. There have also been big payments to service the foreign debt, but they have not generated substantial contractionary effects because of the growing government account served as a buffer against them. In line with this, Zaimov and Hristov (2002) point that "the target of the government to maintain a fiscal reserve […] equal to annual payments on foreign debt creates unwelcome possibilities for the Ministry of Finance to use these funds to affect monetary conditions in the economy." They further characterize the single account as "an overdraft facility." Thus, throughout its activities, the government has mostly performed a sort of monetary expansion which, while having stimulating real effects in the short run, may have destabilizing effects on the macroeconomy in the medium and long term by increasing inflation.

4.5. Deficiencies of the models

The different models differ in switching on and off some of the channels. The use of monetary base and money supply shows similar effects. Parameters are not very stable across models. This is because of the short series relative to the number of parameters to be estimated. This is an argument for a more parsimonious model with less lags, such as model three. Although a calculation was also made including an interest rate on short-term leva loans, this variable had very poor t-values and generally made the model poorer. This is most probably because the tendency of reduction in those interest rates results mostly from factors exogenous to the system at hand. A similar explanation may account also for the instability of the newly-issued loans variable (see the section on BG banking sector).

Other problems with the model are that the t-values of some parameters are pretty poor, and that the response of quantity of newly issued loans is not in the expected direction. The latter observation, though, may reflect the general conservatism of Bulgarian banks after the financial crisis in late 1996. This goes in line with the previous observation that lending standards may actually be independent on monetary policy acts.

5. Conclusion

On the whole, as a country in transition pursuing relatively high levels of growth, Bulgaria has been running increasing current account deficits that have partly been financed by IMF loans and privatization revenues. The funds from these sources go to a centralized government deposit that is a liability to the currency board. Fiscal dynamics necessarily involve dynamics in this deposit that create a liquidity effect and are transmitted to the real sector of the economy. This is so because budget and government spending is large relative to the resources of the thin banking sector and the underdeveloped capital markets in Bulgaria. While such spending puts liquidity in the economy creating an effect of monetary expansion, outflows from the country (used for example to service the foreign debt) are cushioned by the fiscal deposit and do not create a commensurate monetary contraction. Such an asymmetry may create inflationary pressures in the medium to long term. Furthermore, using the government single account at the BNB as an overdraft facility for the budget and for state investment projects may be destabilizing, e.g. by increasing the volatility of the interbank interest rate.

The models in this paper present a visualization of the direction and timing of the monetary transmission (esp. of monetary effect). However, poor t-values and general instability of the parameters due to the short time series do not allow for a proper interpretation of the relative strength (elasticity) of the different channels of transmission. Exogenous factors like the downward trend in interest rates on bank credits make the proper identification of those channels of the transmission mechanism even more difficult. Further research in this area should therefore aim to account for country-specific trends and present the different paths of monetary transmission in a "purer" form.

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Technical Appendix: REGRESSION OUTPUT

Variables:

IMP – imports (goods&services)

REER – real effective exchange rate

LFDEP – logarithm of the fiscal deposit at BNB (end of month)

LFFR – logarithm of interbank interest rate on BGN (spot, end of month)

LIMP – logarithm of imports

LINTCR – logarithm of interest rate on short-term leva loans (incl. overdrafts)

LNL – logarithm of newly issued short-term leva loans by commercial banks to private firms and households

LMBASE – logarithm of monetary base

LM1 – logarithm of money supply (M1)

Equation 1

Dependent Variable: GDP
Method: Least Squares
Sample: 1998:1 2003:2
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IMP	1.052862	0.128532	8.191443	0.0000
C	2662463.	524870.1	5.072614	0.0001
R-squared	0.770378	Mean dependent var		6830122.
Adjusted R-squared	0.758897	S.D. dependent var		1231826.
S.E. of regression	604854.2	Akaike info criterion		29.54987
Sum squared resid	7.32E+12	Schwarz criterion		29.64906
Log likelihood	-323.0486	F-statistic		67.09973
Durbin-Watson stat	1.725142	Prob (F-statistic)		0.000000

Equation 2

Dependent Variable: GDP
Method: Least Squares
Sample: 1998:1 2003:2
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IMP	0.966922	0.164656	5.872375	0.0000
REER	18697.27	22134.72	0.844703	0.4088
C	804398.4	2262305.	0.355566	0.7261
R-squared	0.778689	Mean dependent var		6830122.
Adjusted R-squared	0.755393	S.D. dependent var		1231826.
S.E. of regression	609233.2	Akaike info criterion		29.60391
Sum squared resid	7.05E+12	Schwarz criterion		29.75269
Log likelihood	-322.6431	F-statistic		33.42606
Durbin-Watson stat	1.742138	Prob (F-statistic)		0.000001

VAR 1

Sample(adjusted): 1998:03 2003:09
Included observations: 67 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LFDEP	LFFR	LIMP	LNL	LMBASE
LFDEP(-1)	0.832462	0.177116	0.473987	-1.548235	0.173658
	(0.12184)	(0.57373)	(0.15902)	(5.14205)	(0.07682)
	(6.83214)	(0.30871)	(2.98068)	(-0.30109)	(2.26052)
LFDEP(-2)	-0.050630	-0.926983	-0.298914	7.494812	-0.159940
	(0.13190)	(0.62107)	(0.17214)	(5.56635)	(0.08316)
	(-0.38386)	(-1.49255)	(-1.73645)	(1.34645)	(-1.92326)
LFFR(-1)	0.055264	0.515527	0.016004	1.963110	-0.031375
	(0.02846)	(0.13402)	(0.03715)	(1.20118)	(0.01795)
	(1.94161)	(3.84656)	(0.43083)	(1.63432)	(-1.74834)
LFFR(-2)	-0.056994	-0.092251	-0.004715	-2.053336	0.027668
	(0.02587)	(0.12183)	(0.03377)	(1.09193)	(0.01631)
	(-2.20273)	(-0.75720)	(-0.13964)	(-1.88047)	(1.69607)
LIMP(-1)	0.121042	1.157779	0.547840	3.547963	0.085600
	(0.10682)	(0.50296)	(0.13940)	(4.50778)	(0.06735)
	(1.13318)	(2.30193)	(3.92984)	(0.78708)	(1.27105)

LIMP(-2)	-0.228531	0.018478	0.198227	-3.272739	0.019805
	(0.11123)	(0.52377)	(0.14517)	(4.69425)	(0.07013)
	(-2.05451)	(0.03528)	(1.36547)	(-0.69718)	(0.28240)
LNL(-1)	0.003700	-0.013144	-0.005781	-0.046392	0.000691
	(0.00313)	(0.01475)	(0.00409)	(0.13216)	(0.00197)
	(1.18150)	(-0.89137)	(-1.41451)	(-0.35104)	(0.34979)
LNL(-2)	0.008179	-0.004430	-0.007275	0.003306	-0.001502
	(0.00326)	(0.01534)	(0.00425)	(0.13745)	(0.00205)
	(2.51119)	(-0.28888)	(-1.71156)	(0.02405)	(-0.73133)
LMBASE(-1)	-0.368943	-4.343472	-0.239558	-9.819280	0.656181
	(0.20974)	(0.98759)	(0.27373)	(8.85127)	(0.13224)
	(-1.75907)	(-4.39805)	(-0.87516)	(-1.10936)	(4.96214)
LMBASE(-2)	0.662531	3.375866	0.325692	4.325106	0.222545
	(0.21489)	(1.01183)	(0.28045)	(9.06853)	(0.13548)
	(3.08318)	(3.33639)	(1.16133)	(0.47694)	(1.64260)
C	-0.471905	17.75740	-1.922630	1.630603	0.872126
	(1.35154)	(6.36400)	(1.76390)	(57.0372)	(0.85213)
	(-0.34916)	(2.79029)	(-1.08999)	(0.02859)	(1.02346)
R-squared	0.891624	0.531204	0.890953	0.159345	0.971516
Adj. R-squared	0.872271	0.447490	0.871480	0.009228	0.966430
Sum sq. resids	0.319511	7.084133	0.544220	569.0413	0.127011
S.E. equation	0.075535	0.355672	0.098581	3.187703	0.047624
F-statistic	46.07199	6.345482	45.75399	1.061474	191.0044
Log likelihood	84.01056	-19.79990	66.16980	-166.7341	114.9149
Akaike AIC	-2.179420	0.919400	-1.646860	5.305496	-3.101937
Schwarz SC	-1.817455	1.281365	-1.284895	5.667460	-2.739973
Mean dependent	14.75206	0.949366	7.178777	8.945600	14.89349
S.D. dependent	0.211351	0.478497	0.274985	3.202514	0.259927
Determinant Covariance	Residual	4.14E-08			
Log Likelihood		94.15683			
Akaike Information Criteria		-1.168861			
Schwarz Criteria		0.640962			

VAR 2

Sample(adjusted): 1998:03 2003:09
Included observations: 67 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LFDEP	LFFR	LIMP	LNL	LM1
LFDEP(-1)	0.906815	0.626505	0.485981	-0.321205	0.119104
	(0.11935)	(0.62209)	(0.14505)	(4.92410)	(0.07478)
	(7.59822)	(1.00710)	(3.35053)	(-0.06523)	(1.59262)
LFDEP(-2)	-0.127225	-1.541972	-0.314039	5.738567	-0.088732
	(0.12912)	(0.67305)	(0.15693)	(5.32747)	(0.08091)
	(-0.98531)	(-2.29102)	(-2.00117)	(1.07717)	(-1.09667)
LFFR(-1)	0.026606	0.355785	0.005128	1.623467	-0.015930
	(0.02681)	(0.13977)	(0.03259)	(1.10634)	(0.01680)
	(0.99221)	(2.54549)	(0.15735)	(1.46742)	(-0.94806)
LFFR(-2)	-0.042205	0.036838	0.008571	-1.907657	0.016305
	(0.02550)	(0.13290)	(0.03099)	(1.05197)	(0.01598)
	(-1.65531)	(0.27719)	(0.27660)	(-1.81342)	(1.02054)
LIMP(-1)	0.135279	1.089493	0.613085	2.621900	0.096717
	(0.11547)	(0.60189)	(0.14034)	(4.76420)	(0.07236)
	(1.17155)	(1.81012)	(4.36870)	(0.55033)	(1.33668)
LIMP(-2)	-0.256327	0.283618	0.102004	-0.342080	0.041409
	(0.12044)	(0.62782)	(0.14638)	(4.96944)	(0.07547)
	(-2.12818)	(0.45175)	(0.69684)	(-0.06884)	(0.54866)
LNL(-1)	0.004038	-0.019320	-0.004393	-0.093630	0.001922
	(0.00322)	(0.01678)	(0.00391)	(0.13282)	(0.00202)
	(1.25435)	(-1.15141)	(-1.12294)	(-0.70494)	(0.95288)
LNL(-2)	0.008516	-0.009091	-0.005314	-0.046672	-0.001774
	(0.00336)	(0.01749)	(0.00408)	(0.13848)	(0.00210)
	(2.53740)	(-0.51966)	(-1.30271)	(-0.33704)	(-0.84341)
LM1(-1)	-0.297711	-1.974828	-0.607185	2.758348	0.638080
	(0.22307)	(1.16277)	(0.27111)	(9.20378)	(0.13978)
	(-1.33459)	(-1.69838)	(-2.23963)	(0.29970)	(4.56479)
LM1(-2)	0.556939	1.002053	0.722065	-9.407700	0.214027
	(0.21200)	(1.10505)	(0.25765)	(8.74695)	(0.13284)
	(2.62707)	(0.90679)	(2.80247)	(-1.07554)	(1.61111)
C	0.121105	19.16463	-2.132661	14.52016	0.811316
	(1.33341)	(6.95044)	(1.62055)	(55.0155)	(0.83555)
	(0.09082)	(2.75733)	(-1.31601)	(0.26393)	(0.97100)

R-squared	0.887979	0.406192	0.902256	0.169445	0.977664
Adj. R-squared	0.867975	0.300155	0.884801	0.021132	0.973676
Sum sq. resids	0.330259	8.973224	0.487811	562.2047	0.129679
S.E. equation	0.076795	0.400295	0.093332	3.168496	0.048122
F-statistic	44.39049	3.830655	51.69240	1.142480	245.1176
Log likelihood	82.90227	-27.71889	69.83555	-166.3292	114.2186
Akaike AIC	-2.146337	1.155788	-1.756285	5.293409	-3.081151
Schwarz SC	-1.784372	1.517752	-1.394321	5.655373	-2.719187
Mean dependent	14.75206	0.949366	7.178777	8.945600	15.10737
S.D. dependent	0.211351	0.478497	0.274985	3.202514	0.296593
Determinant Covariance	Residual	4.59E-08			
Log Likelihood		90.71581			
Akaike Information Criteria		-1.066144			
Schwarz Criteria		0.743679			

VAR 3

Sample(adjusted): 1998:03 2003:09
Included observations: 67 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LFDEP	LNL	LMBASE	LFFR
LFDEP(-1)	0.898177	-0.303128	0.184062	0.367424
	(0.11903)	(4.87558)	(0.07410)	(0.57390)
	(7.54553)	(-0.06217)	(2.48384)	(0.64023)
LFDEP(-2)	-0.141849	6.762561	-0.121635	-0.550227
	(0.12230)	(5.00937)	(0.07614)	(0.58965)
	(-1.15984)	(1.34998)	(-1.59758)	(-0.93315)
LNL(-1)	0.003710	-0.040843	0.000976	-0.009669
	(0.00318)	(0.13021)	(0.00198)	(0.01533)
	(1.16711)	(-0.31368)	(0.49304)	(-0.63088)
LNL(-2)	0.006515	-0.026356	-0.001666	-0.008045
	(0.00321)	(0.13129)	(0.00200)	(0.01545)
	(2.03239)	(-0.20074)	(-0.83492)	(-0.52056)
LMBASE(-1)	-0.338226	-8.396085	0.705590	-3.713253
	(0.20718)	(8.48598)	(0.12898)	(0.99887)
	(-1.63252)	(-0.98941)	(5.47061)	(-3.71744)

LMBASE(-2)	0.528684	2.691766	0.249155	3.569078
	(0.20787)	(8.51416)	(0.12941)	(1.00219)
	(2.54336)	(0.31615)	(1.92537)	(3.56128)
LFFR(-1)	0.049422	2.049465	-0.021866	0.625392
	(0.02741)	(1.12265)	(0.01706)	(0.13215)
	(1.80315)	(1.82556)	(-1.28146)	(4.73260)
LFFR(-2)	-0.066061	-2.126402	0.031461	-0.054980
	(0.02578)	(1.05596)	(0.01605)	(0.12430)
	(-2.56242)	(-2.01371)	(1.96026)	(-0.44233)
C	0.697148	-0.618119	-0.234825	5.443599
	(0.71376)	(29.2351)	(0.44434)	(3.44122)
	(0.97673)	(-0.02114)	(-0.52848)	(1.58188)
R-squared	0.883424	0.148184	0.970129	0.471328
Adj. R-squared	0.867344	0.030692	0.966009	0.398408
Sum sq. resids	0.343688	576.5966	0.133199	7.988925
S.E. equation	0.076978	3.152986	0.047922	0.371134
F-statistic	54.94101	1.261225	235.4579	6.463617
Log likelihood	81.56706	-167.1760	113.3213	-23.82656
Akaike AIC	-2.166181	5.258984	-3.114069	0.979897
Schwarz SC	-1.870028	5.555137	-2.817916	1.276050
Mean dependent	14.75206	8.945600	14.89349	0.949366
S.D. dependent	0.211351	3.202514	0.259927	0.478497
Determinant Covariance	Residual	8.05E-06		
Log Likelihood		12.65659		
Akaike Information Criteria		0.696818		
Schwarz Criteria		1.881429		

VAR 4

Sample(adjusted): 1998:03 2003:09
Included observations: 67 after adjusting endpoints
Standard errors & t-statistics in parentheses

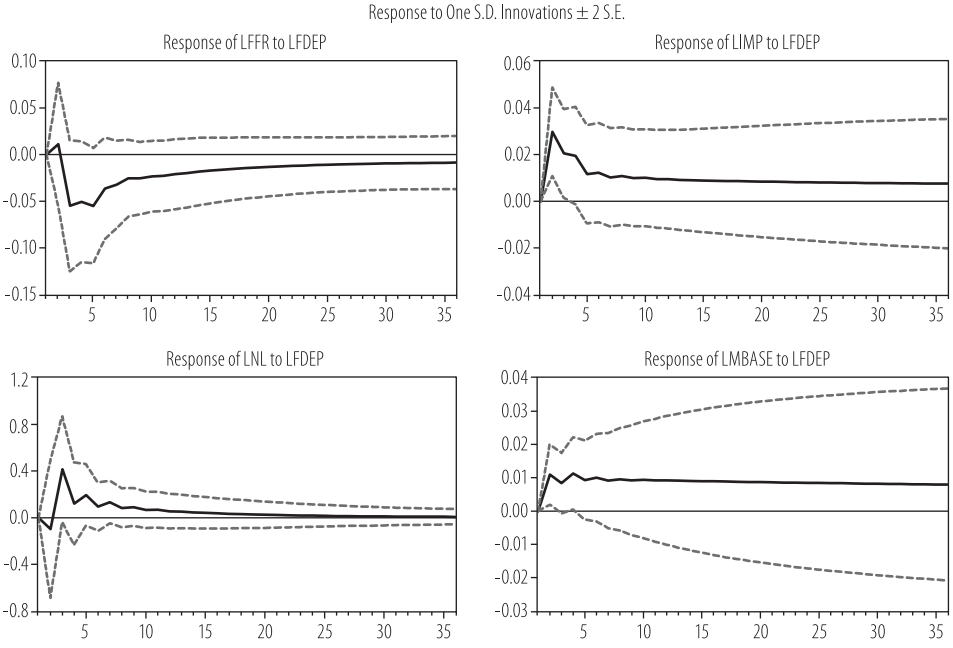
	LFDEP	LFFR	LINTCR	LMBASE	LIMP
LFDEP(-1)	0.873473	0.104694	-0.032709	0.147816	0.380658
	(0.13239)	(0.60498)	(0.13265)	(0.08000)	(0.17290)
	(6.59773)	(0.17305)	(-0.24657)	(1.84762)	(2.20163)
LFDEP(-2)	-0.079807	-0.893348	-0.088685	-0.145005	-0.245293
	(0.13840)	(0.63245)	(0.13868)	(0.08364)	(0.18075)
	(-0.57663)	(-1.41251)	(-0.63951)	(-1.73376)	(-1.35709)
LFFR(-1)	0.039366	0.513964	-0.000366	-0.030559	0.023854
	(0.02908)	(0.13289)	(0.02914)	(0.01757)	(0.03798)
	(1.35369)	(3.86760)	(-0.01257)	(-1.73892)	(0.62808)
LFFR(-2)	-0.028280	-0.107254	0.055918	0.029428	-0.021374
	(0.02690)	(0.12292)	(0.02695)	(0.01626)	(0.03513)
	(-1.05131)	(-0.87253)	(2.07466)	(1.81034)	(-0.60843)
LINTCR(-1)	-0.217818	0.108064	0.051808	-0.084012	0.051752
	(0.12482)	(0.57039)	(0.12507)	(0.07543)	(0.16301)
	(-1.74506)	(0.18946)	(0.41424)	(-1.11379)	(0.31747)
LINTCR(-2)	0.019267	-0.090503	-0.300230	-0.003118	-0.096630
	(0.12572)	(0.57450)	(0.12597)	(0.07597)	(0.16419)
	(0.15325)	(-0.15753)	(-2.38333)	(-0.04104)	(-0.58853)
LMBASE(-1)	-0.260187	-4.505064	-0.298847	0.655578	-0.371153
	(0.22092)	(1.00954)	(0.22136)	(0.13350)	(0.28852)
	(-1.17774)	(-4.46248)	(-1.35004)	(4.91060)	(-1.28641)
LMBASE(-2)	0.387500	3.640933	-0.383727	0.182941	0.506470
	(0.22793)	(1.04156)	(0.22838)	(0.13774)	(0.29767)
	(1.70010)	(3.49565)	(-1.68020)	(1.32819)	(1.70146)
LIMP(-1)	0.064513	1.163205	-0.092635	0.093259	0.589126
	(0.10878)	(0.49709)	(0.10900)	(0.06574)	(0.14206)
	(0.59306)	(2.34002)	(-0.84989)	(1.41870)	(4.14690)
LIMP(-2)	-0.149257	-0.026695	0.155285	0.011364	0.131928
	(0.11227)	(0.51302)	(0.11249)	(0.06784)	(0.14662)
	(-1.32949)	(-0.05203)	(1.38043)	(0.16750)	(0.89981)
C	2.243716	16.89429	14.50713	1.840968	-1.884504
	(2.38808)	(10.9128)	(2.39283)	(1.44311)	(3.11877)
	(0.93955)	(1.54812)	(6.06275)	(1.27569)	(-0.60425)

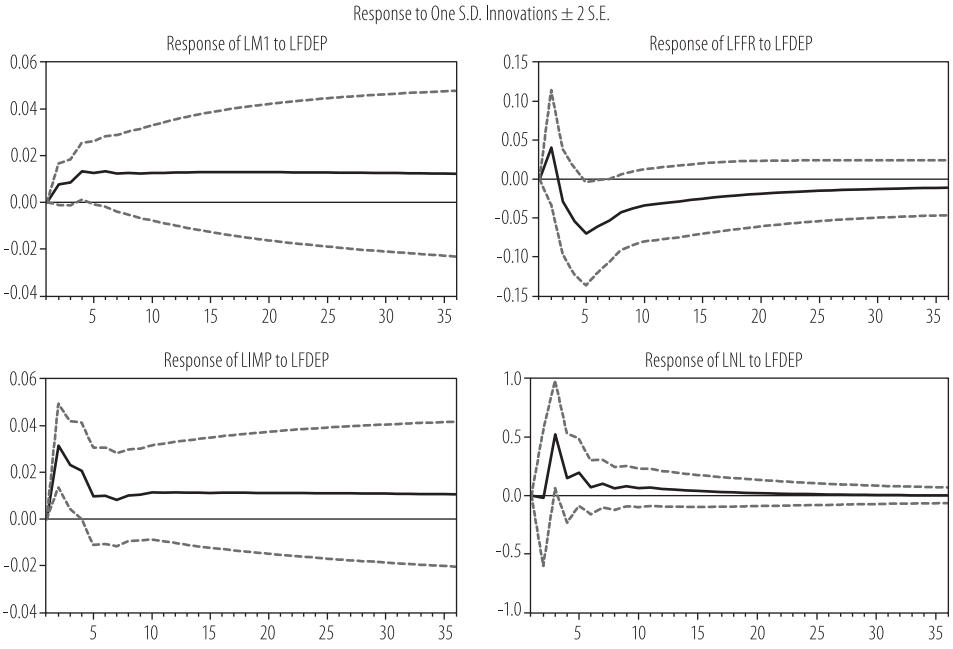
R-squared	0.883259	0.524394	0.817873	0.971814	0.882379
Adj. R-squared	0.862413	0.439464	0.785351	0.966781	0.861375
Sum sq. resids	0.344172	7.187035	0.345544	0.125684	0.587010
S.E. equation	0.078396	0.358246	0.078552	0.047375	0.102383
F-statistic	42.36956	6.174450	25.14784	193.0805	42.01049
Log likelihood	81.51986	-20.28301	81.38661	115.2668	63.63420
Akaike AIC	-2.105070	0.933821	-2.101093	-3.112441	-1.571170
Schwarz SC	-1.743106	1.295786	-1.739128	-2.750477	-1.209206
Mean dependent	14.75206	0.949366	2.452749	14.89349	7.178777
S.D. dependent	0.211351	0.478497	0.169548	0.259927	0.274985
Determinant Covariance	Residual	3.36E-11			
Log Likelihood		332.5349			
Akaike Information Criteria		-8.284624			
Schwarz Criteria		-6.474801			

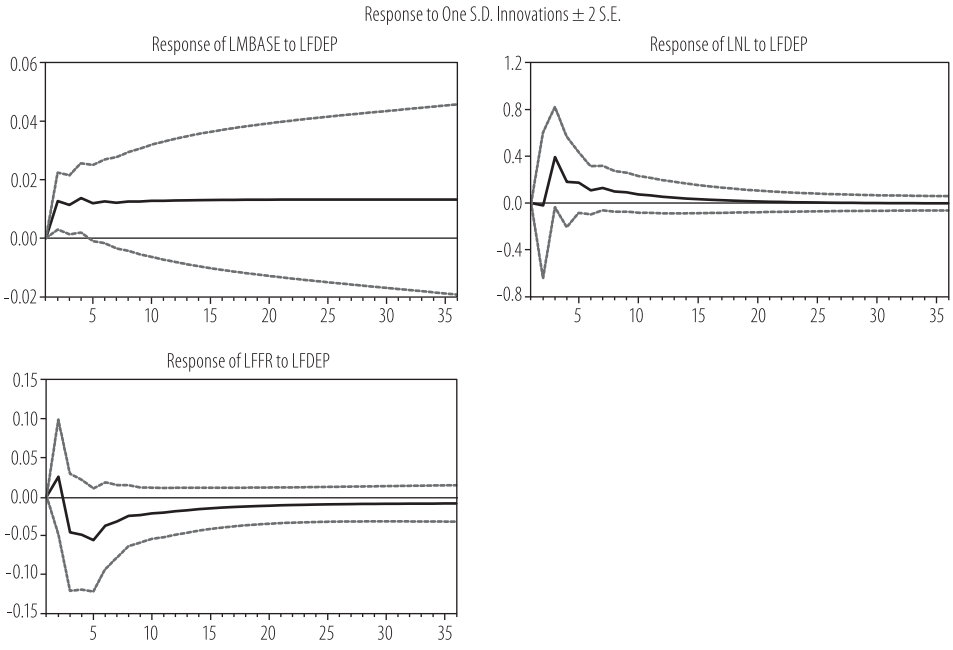
Sample(adjusted): 1998:04 2003:09
Included observations: 66 after adjusting endpoints
Standard errors & t-statistics in parentheses

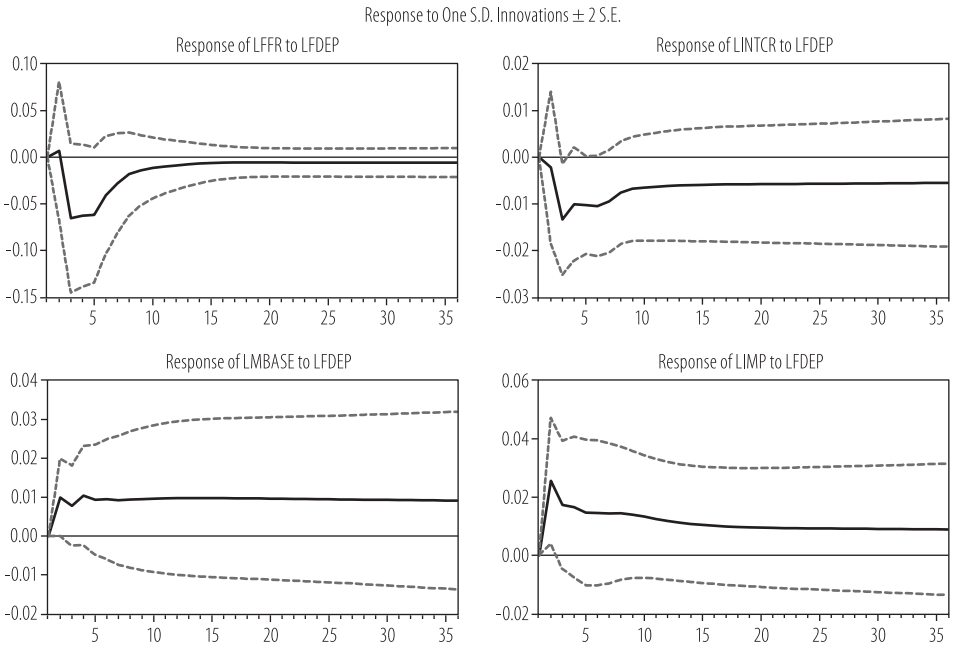
	DLFDEP	DLFFR	DLIMP	DLMBASE
DLFDEP(-1)	0.045904	0.153123	0.406181	0.077255
	(0.13229)	(0.66969)	(0.15269)	(0.07357)
	(0.34701)	(0.22865)	(2.66018)	(1.05003)
DLFDEP(-2)	-0.051065	-0.305541	0.063124	-0.055764
	(0.13016)	(0.65893)	(0.15024)	(0.07239)
	(-0.39232)	(-0.46369)	(0.42017)	(-0.77031)
DLFFR(-1)	0.072883	-0.197804	-0.013629	-0.045686
	(0.02696)	(0.13650)	(0.03112)	(0.01500)
	(2.70307)	(-1.44913)	(-0.43794)	(-3.04652)
DLFFR(-2)	0.039642	-0.120502	4.65E-05	0.013254
	(0.02543)	(0.12876)	(0.02936)	(0.01415)
	(1.55856)	(-0.93585)	(0.00158)	(0.93694)
DLIMP(-1)	0.036569	0.653303	-0.410473	0.058533
	(0.10636)	(0.53845)	(0.12277)	(0.05916)
	(0.34382)	(1.21329)	(-3.34348)	(0.98946)
DLIMP(-2)	-0.205284	-0.053909	-0.290513	0.067034
	(0.10734)	(0.54339)	(0.12389)	(0.05970)
	(-1.91251)	(-0.09921)	(-2.34486)	(1.12287)

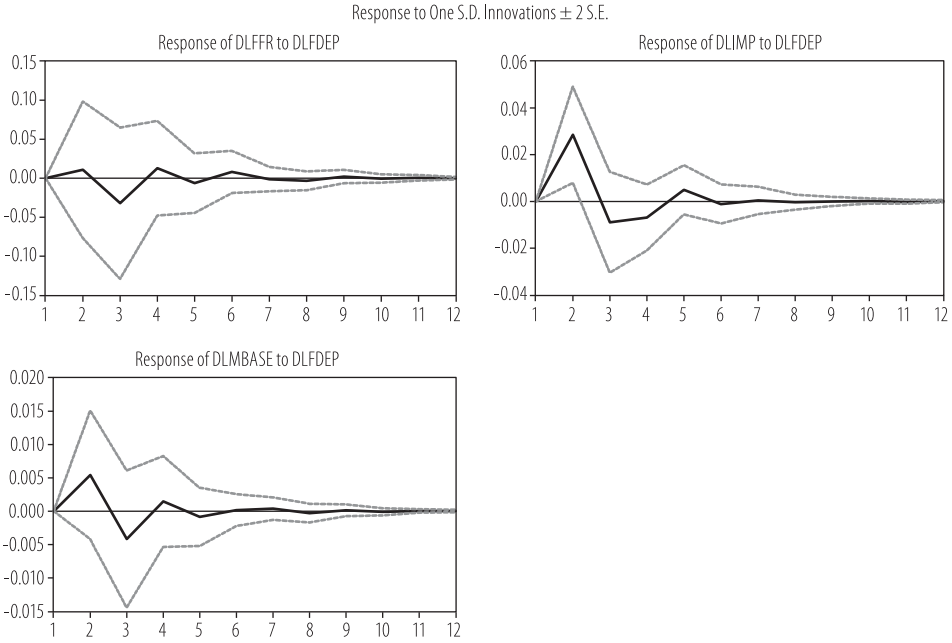
DLMBASE(-1)	-0.308958	-5.087603	-0.515868	-0.310153
	(0.22575)	(1.14284)	(0.26057)	(0.12556)
	(-1.36859)	(-4.45173)	(-1.97979)	(-2.47024)
DLMBASE(-2)	0.319608	-0.854660	-0.686515	-0.442213
	(0.25248)	(1.27815)	(0.29142)	(0.14042)
	(1.26589)	(-0.66867)	(-2.35576)	(-3.14917)
C	0.013052	0.070775	0.029383	0.019983
	(0.01118)	(0.05659)	(0.01290)	(0.00622)
	(1.16751)	(1.25057)	(2.27712)	(3.21392)
R-squared	0.226240	0.347160	0.380039	0.312959
Adj. R-squared	0.117642	0.255534	0.293027	0.216532
Sum sq. resids	0.373914	9.582788	0.498155	0.115663
S.E. equation	0.080993	0.410023	0.093486	0.045046
F-statistic	2.083278	3.788859	4.367668	3.245554
Log likelihood	77.07170	-29.97030	67.60453	115.7920
Akaike AIC	-2.062779	1.180918	-1.775895	-3.236121
Schwarz SC	-1.764190	1.479507	-1.477306	-2.937532
Mean dependent	0.010125	-0.004772	0.009760	0.011942
S.D. dependent	0.086224	0.475210	0.111184	0.050892
Determinant Covariance	Residual	8.99E-09		
Log Likelihood		236.7989		
Akaike Information Criteria		-6.084815		
Schwarz Criteria		-4.890458		


Response to One S.D. Innovations ± 2 S.E.
Response of LFFR to LFDEP
Response of LIMP to LFDEP
Response of LNL to LFDEP
Response of LMBASE to LFDEP


Response to One S.D. Innovations ± 2 S.E.
Response of LM1 to LFDEP
Response of LFFR to LFDEP
Response of LIMP to LFDEP
Response of LNL to LFDEP


Response to One S.D. Innovations ± 2 S.E.
Response of LMBASE to LFDEP
Response of LNL to LFDEP
Response of LFFR to LFDEP


Response to One S.D. Innovations ± 2 S.E.
Response of LFFR to LFDEP
Response of LINTCR to LFDEP
Response of LMBASE to LFDEP
Response of LIMP to LFDEP


Response to One S.D. Innovations ± 2 S.E.
Response of DLFFR to DLFDEP
Response of DLIMP to DLFDEP
Response of DLMBASE to DLFDEP