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Fiscal Explanations for Inflation: Any Evidence from Transition Economies?

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Tuomas Komulainen - Jukka Pirttilä

Fiscal Explanations for Inflation: Any Evidence from Transition Economies? *

Abstract

Recent arguments, motivated partly by the new fiscal theory of price level, suggest that fiscal deficits undermine price stability in transition economies. This paper addresses these claims by examining vector-autoregressive models of inflation for three crisis-hidden transition economies (Bulgaria, Romania and Russia). The results indicate that while fiscal deficits have increased inflation in Bulgaria to a certain extent, this has not been the case in Romania and Russia. Even in the Bulgarian case, the usual money aggregate has proven more influential to inflation than fiscal deficits. The analysis based on this method therefore suggests that monetary policy plays an influential role in inflation determination in these countries. In other words, inflationary financing of deficits, rather than deficits themselves, accounts for inflation.

Key words: fiscal policy, inflation, vector autoregressive models, transition economies

1 Introduction

Fiscal policy has returned to the research agenda in the European context because of its key role in stabilisation under monetary union. In contrast, research on fiscal issues in the transitional context seems to have attracted less interest. There is, however, at least one important exception. A number of recent studies are addressing the importance of controlling fiscal deficits to achieve price stability. For example, Cottarelli and Doyle (1999) present evidence on how large fiscal deficits undermine stabilisation during the early years of transition and how disinflation in most cases require a substantial tightening in fiscal policy. Dabrowski (1999) argues that the failure to bring down budget deficits after initial stabilisation caused the return of high inflation and currency crises in some transition countries. He also explains that in these circumstances, monetary policy lost its power. According to Dabrowski (1999, p. 42) "Basing on empirical evidence of transition countries, it would be very difficult to oppose the thesis that monetary policy alone has limited room of manoeuvre." Moreover, fiscal deficits were regarded as key determinants of financial crises in these countries, most notably in the context of the 1998 financial crash in Russia (see Desai [2000] and Sutela [2000]).

In the theoretical analysis of the determinants of inflation, an interesting new strand of research that emphasises the role of fiscal policy has emerged. According to this theory, the new fiscal theory of price level (NFTP), – where key references include Canzoneri, Cumby and Diba (1998), Cochrane (1999), Sims (1994), and Woodford (1994) – there can be two regimes for price determination. In the so-called 'monetary dominant' regime, the price level is determined by the classical quantity equation. Under this regime, monetary policy effectively determines the price level, but fiscal policy remains reactive. Thus, the government must balance its intertemporal budget (stating that the present value of government future surpluses must be sufficient to pay back the government's net real debt), taking the inflation rate determined by the monetary policy as given. In an alternative, 'fiscal dominant' regime, the price level is determined by the government's intertemporal budget constraint. Here, if the sequence of future surpluses falls short of financing the debt, the price level must adjust (i.e. increase) and reduce the real value of the government debt. In this regime, monetary policy is reactive; that is, money supply reacts to price level changes to bring the money demand equation in balance. Likewise, some standard devices guaranteeing price stability, such as central

bank independence, are not sufficient to pin down the price level without taking action to affect the future fiscal position of the government.

Most transition economies have suffered from long and persistent budget deficits and high inflation figures (see Cottarelli and Doyle [1999]). As a result, transition economies represent potential candidates for the supposition that fiscal dominance may explain inflation. This approach has also been supported by Begg, Halpern and Wyplosz (1999) in their analysis of the exchange rate policy of Central and Eastern Europe with respect to the EU accession policy. Begg et al. (1999) use the fiscal theory of price level as a theoretical motivation for why monetary and exchange rate stability must be backed by prudent fiscal policy in these countries. They have not, however, examined or tested the claim using econometric methods.

The purpose of this paper is to conduct an empirical examination of the extent to which inflation has been affected by fiscal deficits, using data from three crisis-hidden countries, Bulgaria, Romania and Russia, where inflation surged after an initial stabilisation period.[1] More closely, we examine several specifications of vector-autoregressive (VAR) models of consumer prices, budget balance, money growth, exchange rate, and industrial production to see how inflation reacts to budget deficits given other possible determinants of inflation. We also consider how large a share of the forecast-error variance in the price level can be attributed to changes in the fiscal balance in each of these countries. Analysing such VAR models may provide indirect evidence of the presence of a fiscal-dominant regime, if fiscal policy influences the development of the price level in the system. Likewise, if inflation is completely independent of fiscal developments, it is fair to conclude that this would support the traditional monetary dominant regime. In addition, our empirical analysis does not necessarily need to be connected to the new fiscal theory of price level; it can, however, serve as a general assessment of the importance of fiscal deficits for inflation in these countries.

The next section of this paper reviews in more detail literature on the new fiscal theory of price level, its critique, and empirical implications. Section 2 also provides a survey of other analyses of inflation in transition economies. Section 3 describes our empirical approach, and Section 4 presents results from the VAR models. Section 5 discusses potential limitations of and extensions to the analysis. Section 6 offers a brief conclusion.

2 Earlier literature

2.1 The new fiscal theory of price level

The purpose of this section is not to review the entire theoretical literature of determinants of inflation or interdependencies between fiscal policy and inflation, a classical and widely analysed topic in macroeconomics (see Agénor and Montiel [1999], Ch 11, or Turnovsky [2000], Ch 12). The emphasis rather is to provide a brief description of the new fiscal theory of the price level because it is a natural theoretical motivation for our analysis. While a majority of earlier macroeconomic literature stresses the monetary determinants of inflation, such as money supply and exchange rate, the new fiscal theory of price level argues that, in some cases, the price level must adjust to equilibrate the real value of nominal government debt with the present value of surpluses. Cochrane (2000) explains that despite their differences, fiscal theory and quantity theory of price determination are not exclusive of each other, rather, they are different cases of the same theory.

The two equilibrium conditions, which are critical to price determination, are:

$$M_t V = P_t Y \tag{1}$$

$$\frac{W_t}{P_t} = E_t \sum_{j=t}^{\infty} \beta^{j-t} (s_j + \tau_j) \tag{2}$$

where M_t is the nominal money used in period t, Y is income, V is the velocity of money, P is the price level and β is a discount factor. W_t denotes the government liabilities, $B_t + M_t$, where B_t is the stock of net interest bearing liabilities of the public sector. The sum of is the estimated government primary surplus, which includes both the primary surplus, s_j, and central bank transfers (seignorage). The first equation represents a money demand function and the second is a present value government budget constraint.[2]

The government determines debt, money, and surplus $\{B_t, M_t, s_j\}$. The problem is that equations (1) and (2) are two equations with one unknown, P_t. Any equilibrium requires that both (1) and (2) hold. Consequently, fiscal $\{B_t, s_j\}$ and monetary $\{M_t\}$ policies must be co-ordinated to determine the price

level. It is useful to distinguish two special regimes that achieve this co-ordination. If the government or treasury can independently decide fiscal policy and fix the debt and deficit $\{B_t, s_j\}$, then the government budget constraint equation (2) will determine the price level. However, if the monetary authority can first determine monetary policy $\{M_t\}$ in equation (1), then the treasury must adjust its surpluses to this price level. The first case will be referred to as the fiscal-dominant regime and the second will be referred to as the monetary-dominant regime.

This notion is not completely new. Sargent and Wallace (1981) observed that when the fiscal authority sets the budget independently, the monetary authority could only control the timing of inflation. Most of the earlier price determination theories may have overemphasised the role of monetary policy, however, and neglected the role of fiscal policy. Recently, Sims (1994), Woodroff (1994), and Canzoneri et al. (1998) have again emphasised, and formalised, the role of fiscal policy in price determination.

Canzoneri et al. (1999) have also explored the implications of the NFTP on the maintenance of different exchange rate systems. They concluded that a currency peg is not credible if primary surpluses are an exogenous political process. This finding is closely aligned with those expressed in the currency crisis literature, in which the Krugman 1979-model included an undisciplined fiscal policy that resulted in increased government indebtedness (or money creation), and ultimately, currency crisis. Recently, Burnside et al (1998) examined the role of prospective fiscal deficits in the Asian crisis. They found that the prospective public deficits in some of the countries were critical contributors to the crisis.

The new fiscal theory of price level has encountered sharp criticisms. Buiter (1999) criticised the theory for ruling out the possibility of government default. Consequently, without an endogenous default discount factor on the public debt, the model leads to an over determination of the price level in the fiscal regime. Additional criticism concerns the empirical testability of the theory. Cochrane (1999) points out that it is not possible to observe those sequences that reflect off-equilibrium values. Specifically, Cochrane asserts that if some government surpluses violate the present value budget constraint, the prices would react and the off-equilibrium price sequence would remain hidden.

Canzoneri et al. (1998) propose a test for separating the two regimes. The idea is to test whether a positive innovation to the fiscal surplus leads to

a higher or lower real value of government liabilities. If the liabilities fall, then the country is considered to be in the monetary dominated regime. If the positive innovation is not correlated with liabilities or leads to a higher value of liabilities, then the country is considered to be in the fiscal dominant regime. Cochrane (1999) points out that this test method assumes that the value of the debt is forward looking in the fiscal regime (i.e. debt is the present value of future surpluses) and backward looking in the monetary regime (i.e. debt is the accumulation of past surpluses). Canzoneri et al. (1998) applied the test case to US data from 1951-1995. They found that the liabilities fall one period after the innovation, which is consistent with a monetary dominated regime. Unfortunately, we are not able to reproduce the test set-up for transition economies due to the lack of (monthly) data on government liabilities. Consequently, Section 3 addresses the indirect approach used in examining the issue.

2.2 Inflation analysis in transition economies

All transition economies experienced a rapid rise in inflation immediately following the start of transition, some in levels comparable to classical hyperinflation periods. Price liberalisation resulted in an initial correction in the price level; the abolishment of consumer good subsidies had similar impacts. An additional explanation for the high inflation figures was attributed to monetary overhang from the planned era, in which excess savings were quickly used to purchase goods that were available as soon as price liberalisation removed the shortage. The impacts of most of these effects have been documented in the empirical literature focusing on the early macroeconomic experiences of transition economies (see De Melo, Denizer and Gelb [1996]).

The fact that high inflation persisted for years in many of these countries cannot be explained simply by the regime change effects described above. Evidence now indicates that persistent high inflation figures were due to lax monetary policy, inflationary financing of budget deficits (that were especially high during the first two to three years of transition), and various forms of quasi-fiscal deficits, such as providing cheap credit to state-owned enterprises which were financed by increases in the money supply. Several studies support the presence of these impacts. Fischer, Sahay and Vegh (1996) confirmed the harmful impact of a budget deficit for price stability during the early transition years. A recent paper by Cottarelli, Griffiths and Moghadam

(1998), drawing on a panel of data from several samples of transition and emerging markets from 1993-1996, focused on non-monetary determinants of inflation, i.e. regressions that omit monetary variables. Their results indicate that budget deficits had a significant impact on increasing inflation, especially during those years when the countries did not have access to government security markets.

Hernandez-Cata (1999) considered the impact of monetary policy on inflation in transition economies, with a number of other variables (e.g. price liberalisation and initial conditions of the countries), and found a robust, positive impact from broad money growth on inflation. Further, Wolf (1999) combined the two approaches in his analysis of inflation experience of transition economies in 1990-1997. In the regressions run by the instrumental variable technique to address possible endogeneity, money growth continued to have a significant positive impact on inflation, while fiscal deficit lost its explanatory power. Though this result may well be due to collinearity between fiscal balance and money growth variables, it is potentially valuable for the purposes of our study in terms of examining whether fiscal deficits influence inflation when other factors are also considered.

In addition to the panel regressions using annual data, there are several inflation studies that are based on a time series from one country. Perhaps closest to our analysis is a paper by Kim (1998) that analyses Polish inflation by considering four different sources of inflation: monetary expansion, wage inflation, imported inflation, and fiscal deficits. Kim first estimated an error-correction formulation for each unique inflation channel separately, and then used the derived error-correction terms in a dynamic short-run model of Polish inflation. An interesting result with respect to the topic in the current paper is that the term representing the fiscal deficit channel was not significant in the short-run model and hence can be dropped from the final specification.

A final strand of earlier literature adopts the same VAR methodology as presented in our paper and drew on monthly data from one to three transition economies. These include Ross (1998), where Slovenian inflation was analysed with a VAR model of prices, money growth, wages, and exchange rate movements, and Brada and Kutan (1999), who analysed inflation behaviour in Hungary, Poland and the Czech Republic. The endogenous variables consisted of inflation, money, wages and import prices. Despite the fact that many of the variables could be non-stationary, none of the studies examined an error-correction formulation of the regression equations.[3] Korhonen (1998)

carried out a VEC formulation for the Russian inflation case, where other endogenous variables include money, output and interest rates. However, none of the studies based on the VAR method considered the interaction between fiscal policy and inflation.

3 Empirical methodology

The purpose of this study is to examine inflationary response to budget deficits, when associated variables, such as money growth, are taken into account. The premise holds that if an economy is in a fiscal-dominant regime, fiscal deficits should have some impact on inflation, whereas in a monetary-dominant regime, inflation would be driven primarily by money supply. In addition to analysing inflationary response, we considered the shares explained in the variation of inflation by fiscal deficits and money growth. If money supply dominates the inflation process but deficits have no influence on inflation, then indirect evidence that supports the monetary-dominant regime can be obtained.

Our method to test the regime dominance is of course an indirect one. It seems to us that it may serve at least as a way of rejecting the fiscal-dominant regime if fiscal deficits are not at all connected to inflation. In addition, findings can be regarded as a general assessment of the importance of fiscal deficits, where only one line of motivation represents the possible connection to the new fiscal theory of price level.

Note that the government present-value budget constraint is based on expectations of the path of future government surpluses, whereas the VAR models we examined capture the dynamics of the system based on backward-looking values. It is impossible to account for changes to the path of surpluses outside the realm of experiences previously documented. We may, however, investigate a case where expectations are to some extent backward-looking. To illustrate, the expectations might take the following adaptive form:

$$E_t(s_{t+j}) = E_{t-1}(s_{t+j}) + f\left\{\sum_{\tau=t-1}^{t-k}\left[s_\tau - E_{\tau-1}(s_\tau)\right]\right\}$$

where *f* is an increasing function. In other words, the agents update their expectations of a future surplus based on the deviations of a number of realised recent values of the surplus as opposed to their expected values. To a certain extent, it appears that the expectations depend on historical values; that is, a time-dependent expected value of a future surplus and a value based on previous budget performance. The latter relates to a path-dependent factor of the state of government fiscal policy. We assert that a representation such as this is realistic, especially in the case of transition economies where uncertainty about further surplus values is very high in any case, with a requirement to base the expectations on a variable such as historical values.

Because the method employed is indirectly connected to theory, we examined a number of different empirical specifications of the unstructural VAR models:

1) In the first set-up, the endogenous variables include the price level, a money aggregate (M2 in the case of Bulgaria and Russia, M3 in Romania), an exchange rate to the USD, and the fiscal balance (with deficits indicated by negative values). This specification is intended to capture the impact of a fiscal balance on prices and exchange rate – with the latter impact providing a means to address the open-economy version of the fiscal theory.

2) Because of a high correlation between price and exchange rate movements, we also analysed a three variable VAR with prices, money, and fiscal deficits. The purpose of this approach was to determine whether the additional efficiency in estimation helps deduce sharper conclusions about the key issue addressed and the impact of deficits on prices.

3) The third formulation includes prices, money, fiscal deficits, and industrial production (as an output index). A real sector variable was included to determine whether the dynamics of the model change when possible impacts from the real sector are taken into account. Further, the real sector variable was also used because the basis for the monetary regime, the quantity equation, includes output. Because monthly data on GDP are not available, industrial production is used as a proxy for the whole output.

In what follows, we report results for Cases 1 and 3. In conducting the analysis in Case 2, it was determined that the key qualitative results do not change, and the results are thus are not reported here.[4] Finally, a preliminary look at a VAR model with prices, fiscal balance, and industrial output was considered to determine whether results are different when multico-linearity between money supply and fiscal deficits is solved by omitting M2 from the model. Given that the modification does not seem to change the impact of fiscal policy but instead dramatically weakens the overall quality of the results, it is not reported below.[5]

All specifications are based on unstructural VAR models. While it might be interesting to impose some restrictions (and thus analyse structural VARs), it is not clear what form they should take given the present framework. To illustrate one widely used option, the Blanchard-Quah (1989) decomposition, that separates disturbances to those that have permanent effects on output from those that do not, cannot be directly applied here. It is not clear how one should divide monetary and fiscal shocks to permanently and temporarily affecting variables.[6]

The data used are from WIIW, the Vienna Institute for International Economic Studies, a monthly database that covers the period of 1993:1 to 1999:12.[7] Data on money and fiscal deficit are nominal and are presented in local currency. Figures 1-6 contain all key variables in Bulgaria, Romania, and Russia, first in log-levels[8], and then in first-differences. An appendix to the paper describes the abbreviations used for the variables.

As can be observed from these figures, some of the series exhibit considerable monthly variation. This is especially pronounced in the fiscal series. We therefore seasonally adjusted those series that seemed to feature significant monthly variation with the Census II X11 method and used the adjusted series in the subsequent analysis. In addition, we normalised the fiscal series by the price level to remove the non-stationary related to variance from the fiscal data. The resulting normalised fiscal series (depicted with an n) is presented in Figures 7-9.[9]

Before the actual regression analysis, we investigated the stationarity of the variables by the Adjusted Dickey-Fuller unit root tests, and conducted pairwise Granger causality tests of price level versus the other endogenous variables. Results from the unit-root tests (reported in Tables 1-3) indicate that for all countries, prices, money, and exchange rates are I(1) variables, whereas the balance is I(0). Because of an omission of fiscal balance from

the long-term equilibrium condition, only an analysis of VAR without the error-correction formulation (as in Ross [1999]), with variables in stationary form, was conducted.[10]

Because of the relatively short time series, the shortest possible lag structure was chosen that would guarantee that residuals are white noise. This approach results in three to four lags in the regressions, accompanied in some cases with a seasonal dummy for December values.[11] For the impulse-response analysis, the ordering of the variables can have significant impacts, at least for the short-run dynamics. In our analysis, the price level was held as the most endogenous variable, whereas fiscal balance represents the most exogenous variable. This framework provides for, in principle, the best opportunities for fiscal balance to influence price formation. Hence, this represents the best ordering to analyse rejection of the fiscal dominant regime.

The above analysis assumes that a country has been in the same regime for the entire estimation period. However, during the crisis months, big jumps in the data were reported, opening up a possibility for a breakpoint analysis. For this, two approaches were employed. First, using the Chow test, we sought to determine whether the crisis amounted to a statistically significant breakpoint for the price equation of the VAR model. The presence of a significant breakpoint was accepted in Bulgaria, 1997:2, and in Russia, 1998:8, but rejected in Romania in 1997, for the first three months. Then, we estimated the VAR for the two sub-samples in Bulgaria and Russia and examined how well the model predicted the crisis. However, it became clear that because of data limitations, the piecewise regressions might encounter difficulties, as was the case to a certain extent in our study. Due to the existence of conceptual uncertainties within the regime shift issue,[12] discussion concerning the regime shifts is limited.

4 Regression results

4.1 Bulgaria

According to the first results from the adjusted Dickey-Fuller unit root tests (reported in Table 1), it appears that prices, money, the exchange rate, and industrial production represent I (1) variables, whereas the fiscal balance is I

(0). In what follows, all variables are included (with the exception of fiscal balance) in the first-difference form to assure that these variables are stationary. Table 2 presents the results from pairwise Granger causality tests (presented in levels and in first differences). These are included as a preliminary step to investigate the interaction between the series. The results suggest that, while only weak evidence that fiscal balance would cause price level changes in the Granger causality tests can be found, money and exchange influence and are dependent on price level changes.

In the actual VAR analysis, we present results from the set-ups in Cases 1 and 3 that are described in the previous section. In the first model (Model 1), the endogenous variables include prices, money, exchange rate, and fiscal balance in first differences. The chosen lag length is 6, and the ordering of the variables is as follows: fiscal balance, M2, exchange rate, and consumer prices. Figure 10 depicts the impulse responses from Model 1. In this interpretation, the main emphasis is on the last row that contains the responses of the price level to innovations in other variables. The signs of the reaction in prices, with respect to money and exchange rate, are expected; additionally, prices seem to react negatively to improvements in balance. Forecast-error variance decomposition charts (Figure 11) indicate that up to 20% of the variance in prices is explained by the fiscal variable, whereas money seems to be more influential. The share of fiscal balance in explaining variance in the exchange rate is also around 20%. Therefore, while fiscal balance explains some of the price movements, the results of Model 1 suggest that money growth is more influential, supporting the monetary-dominant regime.[13] Although not a main emphasis in this paper, the first row (responses of fiscal balance to innovations) shows that fiscal balance is not very responsive to other variables in the model.

A possible problem in the VAR model described above is that impacts arising from the real side of the economy are not taken into account. Therefore, we also considered another model, Model 3, of money, exchange rate, industrial output, and fiscal balance.[14] The results in Figures 12 and 13 provide similar support for the fiscal theory that the impulse response of prices is robustly negative; and, up to 20% of the price variation can be explained by the fiscal balance innovations. However, it remains the case that monetary policy explains a larger share of price changes than does fiscal policy. To sum, while the results give some support for fiscal impacts in the price level, the evidence seems to confirm that monetary policy dominates price forma-

tion in Bulgaria.

Finally, we attempted to approach the question of a possible regime change around the Bulgarian currency crises in early 1997. We first checked for the possibility of a structural break in the price equation of Model 1 in 1997:2. The Chow tests strongly rejected (p-value < 0.01) the hypothesis of no structural break, and therefore, the VAR for the two sub-samples (with lag structure simplified to just 2 to save degrees of freedom) was estimated. Results demonstrated that the confidence intervals in the VAR estimated for the pre-crisis period explode. To assess the stability of the parameters, an exercise was conducted in which pre-crisis values were forecasted with a model where parameters were estimated from the entire sample. A comparison of the actual prices to the forecasted prices (depicted with an F in Figure 15) shows that the model cannot capture the drastic price change. This indicates that there are limits to the extent to which we can understand the determinants of the crisis within this framework.

4.2 Romania

The unit root tests presented in Table 3 indicate that all variables, with the exception of fiscal balance, represent I(1) series. Though fiscal balance is a somewhat questionable case, it seems to be more representative of the I(0) type series. In the estimations below, all other variables are therefore differentiated. The Granger causality tests reported in Table 4 suggest that fiscal balance does not cause variation in the price series, whereas money and prices, as well as exchange rate and prices, are clearly interdependent.

In the VAR analysis, we used the model with a fiscal balance, money (M3), exchange rate to USD, and consumer prices (Model 1) to capture the potential impacts on the exchange rate as well. Three lags and a seasonal dummy for December were sufficient to remove autocorrelation from the residuals. Here again, we used the same ordering, i.e. fiscal balance, money, exchange rate, and prices. The impulse responses of Model 1 are depicted in Figure 15 and show that the money and exchange rate have correct signs, whereas the fiscal balance seems to be ineffective. In addition, forecast error variance decompositions represented in Figure 16 strongly support the monetary-dominant regime. Fiscal balance was determined to have no impact on other variables. Further, the series itself seems to be non-responsive to other variables. Dropping the exchange rate and considering a VAR with fiscal

balance, money, industrial output, and prices (Model 3) demonstrated no change (Figures 17 and 18). In sum, Romanian results do not provide any support for the fiscal regime.[15]

4.3 Russia

Unit root tests in Table 5 show that normalised balance is a I (0) series, whereas other variables represent I (1), and therefore, are always differentiated below. Table 6 presents, again, the piecewise Granger causality tests. The results indicate that fiscal balance does not cause movements in the price series using the Granger test. What is striking, however, is that while the exchange rate is clearly influential, M2 does not cause movements in the price series either.

Model 1 (Figures 19 and 20) contains fiscal balance, M2, exchange rate to the USD, and consumer prices (this is also the ordering used in the impulse response analysis). Three lags and a seasonal dummy for December were needed to abolish autocorrelation from the residuals. The impulse response analysis shows that fiscal balance does not have a significantly deviating effect from zero, whereas money and exchange rate innovations have positive signs for prices. Variance decomposition revealed a surprisingly large effect from the exchange rate to prices; money was shown to be much less significant in the Russian case. The probable explanation for this is that the exchange rate reflects expectations of future inflation pressures and is therefore an important determinant of the current price level. Moreover, dollarisation and the use of foreign currency related prices constitute another probable explanation for the large share of the exchange rate in inflation determination. Fiscal balance does not affect inflation in the Russian case; thus, no support for the fiscal theory was obtained. Considering the model with industrial output (Model 3, Figures 21 and 22) seems to yield a poor behaving VAR with a very large amount of price variance explained by its own innovations.[16]

For the Russian case, the Chow test for the price equation of the VAR model was able to reject the null hypothesis of no structural break during the autumn 1998 crisis (1998:8 or 9). We therefore estimated the VAR model for the sub-sample prior to the crisis (1993:1-1998:7). The impulse responses from this model were rather similar to those recorded in the entire sample, with the fiscal balance accounting for somewhat more of the price changes in the pre-crisis period. However, the forecast for the prices (Figure 23), based

on the parameters estimated from the sub-sample prior to the crisis, could not predict the price hike in the latter half of 1998.

5 Discussion

While the results documented above give only limited support for the fiscal explanations of inflation, they are consistent with the classical explanations emphasising the role of monetary policy (and in the Russian case, effects arising from the foreign exchange rate). To a certain extent, one can argue that in almost all of the regressions, the signs of the impacts from fiscal balance are correct though the significance is small. The low significance may be partially due to a small sample problem and/or related to transition-specific issues, e.g. structural changes that disturb the analysis and poor data quality.

If interpreted as a test of economic policy regime, there are some shortcomings in our analysis. The first is that the fiscal theory of price level is formulated in terms of primary deficits, whereas our data only contain the complete deficit. Our regressions are arguably still sensible, because the investors may also take into account the impacts of changes in debt-servicing costs. Further, the analysis is in any case an indirect test of the theory itself. Second, we are obliged to use monthly data, even though the fiscal policy-planning horizon usually covers the entire fiscal year. In transition economies, however, budgets have not always assumed the role they have in developed economies. As a result, there exist examples in which expenditures depend on collected revenues during the same month (sequestration). Third, because of a lack of data, we were forced to abstract from the analysis of quasi-fiscal deficits that show up in monetary policy, such as cheap loans to state-owned enterprises. Therefore, money supply increases need not in all cases reflect genuine monetary policy, but can target objectives of a combined government, i.e. operations that are more fiscal in nature. Given that quasi-fiscal deficits have been particularly pronounced in many transition economies, especially in early years (see e.g. De Melo et al [1996]), some of our results may underestimate the role of fiscal policy.

What is perhaps the most significant caveat to discuss is that we are not able to separate the impacts of genuine monetary policy from fiscal policy in those instances in which they are closely connected through central bank financing of the deficits. In other words, monetary policy may not be exog-

enous to fiscal policy.[17] Table 7 compares annual figures on budget deficits, central bank financing of the deficits, and inflation for the three countries. It can be inferred from the figures that while there is only a minor downward pattern in the fiscal deficits, the initial stabilisation in all of these countries included reducing the central bank financing of the deficits (and, hence, a move to the use of bonds to cover the deficits). Decreases in inflation rate followed the reduction of the central bank financing of the deficits. It appears that inflation is related more to the method used to finance the deficits than the deficits themselves. This result therefore supports the monetary determinants of inflation: Inflationary financing of the deficits, rather than the deficits themselves, seems to be more significant in determining inflation.

However, the fiscal determinants of inflation may be more related to the crisis periods (reflected as structural breaks in the data), capturing moves in price levels that were unsustainable because of deficits. This mechanism, whether it is true or not, is unfortunately difficult to examine by the VAR method adapted in the present paper. There are also some conceptual uncertainties concerning the regime change issue. On the other hand, if the crisis depends on past fiscal values, it is assumed that the economy was in the fiscal-dominant regime prior to the crisis. Following the correction of the price level, there would exist again possibilities for the monetary-dominant regime. However, one could also argue that the fiscal-regime steps in when the monetary policy has lost control, and the time following the crisis would be fiscal-dominant.

While addressing any of the above mentioned caveats would certainly be worthwhile, in many cases, data limitations hinder extensions for more sophisticated analyses. Finally, it is useful to discuss other ways to extend the analysis. Because the original Canzoneri et al (1998) test is not feasible for single countries due to a lack of data, it might be possible to conduct the analysis using (annual) panel data on government debt and deficits from all transition economies. Another worthwhile exercise would be to examine how fiscal policy affects other key variables in the economy, and how fiscal policy itself reacts to GDP changes, among other variables. Using this approach, it may be possible to analyse whether fiscal policy has a Keynesian or Non-Keynesian effect in transition countries, to what extent it is counter-cyclical, and whether the impacts are different in successful transition economies versus those of less developed transition economies.

6 Conclusions

This paper examined unstructural VAR models of prices, exchange rate, money, and fiscal balance for Bulgaria, Romania and Russia. These VAR models can be utilised to investigate whether fiscal balances have had any impact on prices or the exchange rate, given the other variables in the VAR. This may be interpreted as an indirect test of the fiscal theory of price level, which is often argued to be relevant for transition economies. The results show that while fiscal deficits increase inflation somewhat in Bulgaria, inflation seems to be completely non-responsive to fiscal deficits in Romania and Russia. Results based on our method do not support the presence of a fiscal-dominant regime in these countries. Specifically, our results demonstrate that the inflationary method of financing the deficits, rather than the deficits themselves, affect the price level – a point stressed in traditional macroeconomics. In the event that fiscal theory of price determination could be considered valid for these countries, it appears yet impossible to prove using traditional econometric methods.

While we argued that our testing approach – where expectations of future deficits must be partially dependent on historical values of the fiscal balance – could be relevant for transition economies, we also recognise that there are potentially significant shortcomings in our analysis. Many of these shortcomings are related to a lack of or poor quality of data. While addressing these shortcomings would no doubt be important, the present analysis, we believe, can shed some light on the role of fiscal deficits in explaining inflation and point to further research in the area.

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Appendixes

List of variables

Bal	fiscal balance
Baln	normalised fiscal balance
Cpi	consumer price index
Exr	exchange rate to the USD, monthly average
Ind	volume index of industrial production
M2	broad money
M3	broad money (for Romania)

L indicates logarithms
D indicates first differences
F indicates a forecasted value
HP indicates Hodrick-Prescott filtered series
SA indicates seasonally adjusted series

Table 1 Bulgaria: Unit Root Test

Bulgaria: ADF unit root tests

All others but bal: Levels: constant and trend included; first-differences: constant included
Bal: Levels: constant included
(*), (**), (***) indicate rejection of the null hypothesis
at significance levels 10, 5, and 1 percent, respectively

		Levels	First-differences
Variable	Lag length		
lcpi	4	-1,96	-3,453**
	3	-1,756	-4,057**
	2	-1,659	-4,99***
	1	-1,716	-6,651***
lexr	4	-1,934	-3,65***
	3	-1,983	-4,56***
	2	-2,016	-5,022***
	1	-1,813	-5,687***
lm2	4	-1,822	-3,238**
	3	-1,834	-4,222***
	2	-1,762	-4,722***
	1	-1,625	-5,442***
lindsa	4	-1,812	-5,095***
	3	-1,781	-5,658***
	2	-1,775	-6,970***
	1	-2,328	-10,738***
baln	4	-4,946***	
	3	-7,858***	
	2	-20,603***	
	1	-10,062***	
balhp	4	-2,683*	-3,773***
	3	-2,72*	-2,807*
	2	-1,89	-2,951**
	1	-4,165***	-4,821***

Table 2 Bulgaria: Pairwise Granger Causality Tests

Bulgaria: Pairwise Granger Causality Tests

F-test statistics for the null hypothesis:
Independent variable does not Granger cause the dependent variable

(***), (**) and (*) denote significance at 1, 5 and 10 percent level, respectively

	Lag length		
	12	6	3
baln -> dlcpi	2,068*	2,996**	1,453
dlcpi -> baln	0,866	0,253	0,263
balhp -> dlcpi	0,708	1,412	3,343**
dlcpi -> balhp	1,716**	0,371	0,349
dlm2 -> dlcpi	4,427***	8,556***	12,645***
dlcpi -> dlm2	3,008***	3,780***	3,208**
dlexr -> dlcpi	3,501***	6,370***	9,086***
dlcpi -> dlexr	1,481	2,655**	3,366**
dlindsa -> dlcpi	0,849	1,589	3,407**
dlcpi -> dlindsa	1,068	1,096	1,792

Table 3 Romania: Unit Root Tests

Romania: ADF unit roots tests

All others but bal: Levels: constant and trend included; first-differences: constant included
Bal: Levels: constant included
(*), (**), (***) indicate rejection of the null hypothesis
at significance levels 10, 5, and 1 percent, respectively

		Levels	First-differences
Variable	Lag length		
lcpi	4	-1,99	-2,681**
	3	-1,452	-3,088**
	2	-2,213	-3,810***
	1	-1,987	-4,008***
lexr	4	-2,649	-5,376***
	3	-2,412	-5,788***
	2	-3,267**	-6,523***
	1	-2,963	-7,401***
lm3	4	-0,493	-4,650**
	3	-0,794	-5,182***
	2	-0,606	-5,467***
	1	-0,776	-7,110***
lindsa	4	-0,785	-3,662***
	3	-0,879	-4,773***
	2	-0,877	-5,809***
	1	-1,51	-9,033***
balhp	4	-3,123	-5,494***
	3	-3,810*	-6,146***
	2	-4,221***	-5,782***
	1	-9,674***	-5,797***
balnsa	4	-2,712	-5,820***
	3	-3,144	-7,087***
	2	-3,731**	-8,295***
	1	-5,282***	-11,541***

Table 4 Romania: Granger Causality Tests

Romania: Pairwise Granger Causality Tests

F-test statistics for the null hypothesis:
Independent variable does not Granger cause the dependent variable

(***), (**) and (*) denote significance at 1, 5 and 10 percent level, respectively

	Lag length		
	12	6	3
balnsa -> dlcpi	1,013	0,269	0,339
dlcpi -> balnsa	0,805	1,61	0,972
balhp -> dlcpi	0,427	0,536	0,201
dlcpi -> balhp	0,487	0,47	0,356
dlm3 -> dlcpi	1,764*	3,583***	3,641***
dlcpi -> dlm3	2,003**	0,349	1,165
dlexr -> dlcpi	4,534***	6,315***	11,786***
dlcpi -> dlexr	1,716*	1,074	1,863
dlindsa -> dlcpi	0,71	0,411	1,783
dlcpi -> dlindsa	2,584**	1,522	1,176

Table 5 Russia: Unit Root Tests

Russia: ADF unit root tests

All others but bal: Levels: constant and trend included; first-differences: constant included
Bal: Levels: constant included
(*), (**), (***) indicate rejection of the null hypothesis
at significance levels 10, 5, and 1 percent, respectively

		Levels	First-differences
Variable	Lag length		
lcpi	4	-1,561	-3,215**
	3	-1,241	-3,674***
	2	-1,751	-4,123***
	1	-1,539	-4,814***
lexr	4	-2,417	-4,482***
	3	-2,275	-4,577***
	2	-2,151	-4,945***
	1	-1,956	-6,013***
lm2	4	-1,234	-2,465
	3	-1,119	-2,561
	2	-1,131	-2,901**
	1	-0,727	-3,151**
	4	-1,153	-3,406**
balhp	3	-1,224	-3,712***
	2	-0,813	-4,073***
	1	-6,085***	-6,102***
baln	4	-3,29*	-5,343***
	3	-3,321*	-7,054***
	2	-4,467***	-9,660***
	1	-5,895***	11,211***
lind	4	-2,828	-3,09**
	3	-3,128	-3,5**
	2	-2,52	-4,130***
	1	-1,748	-6,586***

Table 6 Russia: Granger Causality Tests

Russia: Pairwise Granger Causality Tests

F-test statistics for the null hypothesis:
Independent variable does not Granger cause the dependent variable

(***), (**) and (*) denote significance at 1, 5 and 10 percent level, respectively

	Lag length		
	12	6	3
baln -> dlcpi	0,651	0,363	0,603
dlcpi -> baln	1,163	0,474	0,182
balhp -> dlcpi	0,583	0,742	0,933
dlcpi -> balhp	1,863*	2,369**	1,345
dlm2 -> dlcpi	0,593	1,995*	1,637
dlcpi -> dlm2	5,108***	4,562***	2,605*
dlexr -> dlcpi	0,621	5,961***	10,114***
dlcpi -> dlexr	2,215**	2,85**	3,61**
dlind -> dlcpi	0,528	0,137	0,04
dlcpi -> dlind	0,637	0,986	2,332*

Table 7 Central Bank Financing of the Deficits

CB financing of the budget deficit

Russia	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**
Deficit (% of GDP)	-23.1	-6.5	-11.4	-5.4	-7.9	-6.7	-4.9	-1.7
CB f.o.d. (% of GDP)	9.2	5.9	8.1	1.6	2.1	1,3	4,6	1
inflation	2318	842	224	131	22	11	84	36.5

Romania	**92**	**93**	**94**	**95**	**96**	**97**	**98**
Deficit (% of GDP)	-4.4	-2.7	-3	-4.1	-4.9	-3.6	-3.1
CB f.o.d. (% of GDP)		0,6	3,0	2,2	0,0	1,3	
inflation	210	256	137	32	39	155	59

Bulgaria	**92**	**93**	**94**	**95**	**96**	**97**	**98**
Deficit (% of GDP)	-5.2	-10.9	-5.8	-6.3	-12.7	-2.5	1
CB f.o.d. (% of GDP)	6	11	5.5	4.9	14.5	0	0
inflation	82	73	96	62	123	1082	22

Source: Cottarelli - Doyle 1999, IMF 1998; Hunya 1999, EBRD 1999
Note: Country figures are not comparable, because they are from different sources.

Figure 1 Bulgaria: Levels

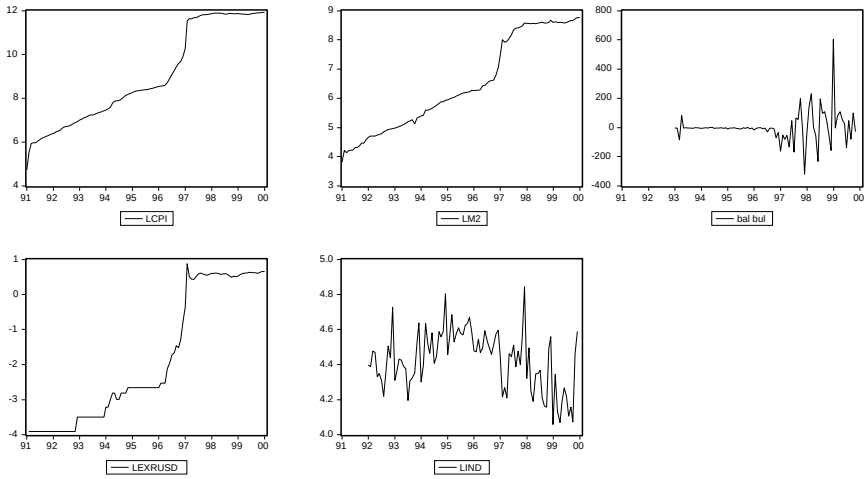


Figure 2 Romania: Levels

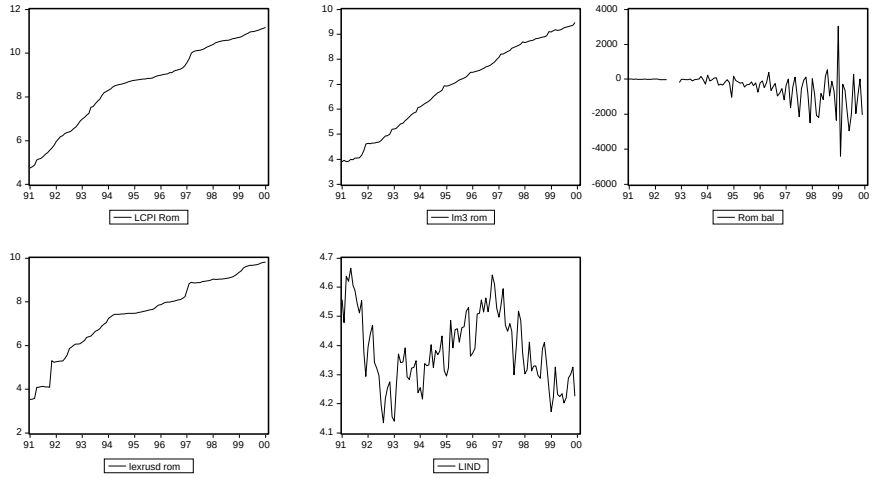


Figure 3 Russia: Levels

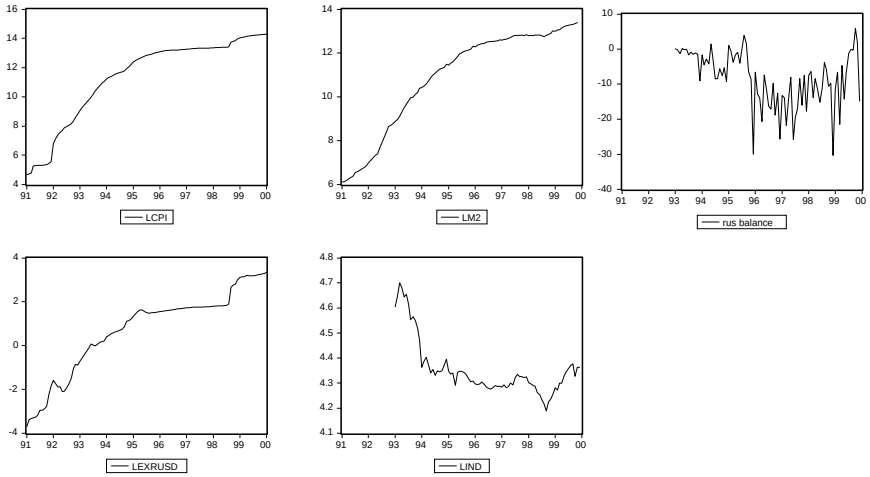


Figure 4 Bulgaria: First Differences

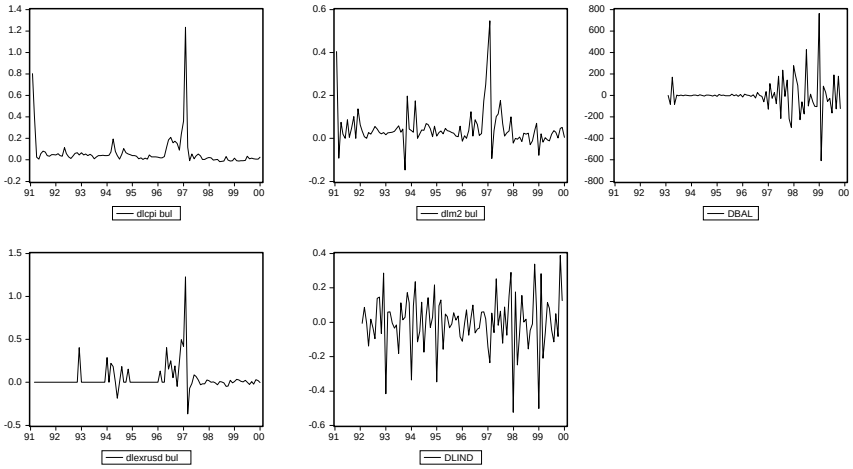


Figure 5 Romania: First Differences

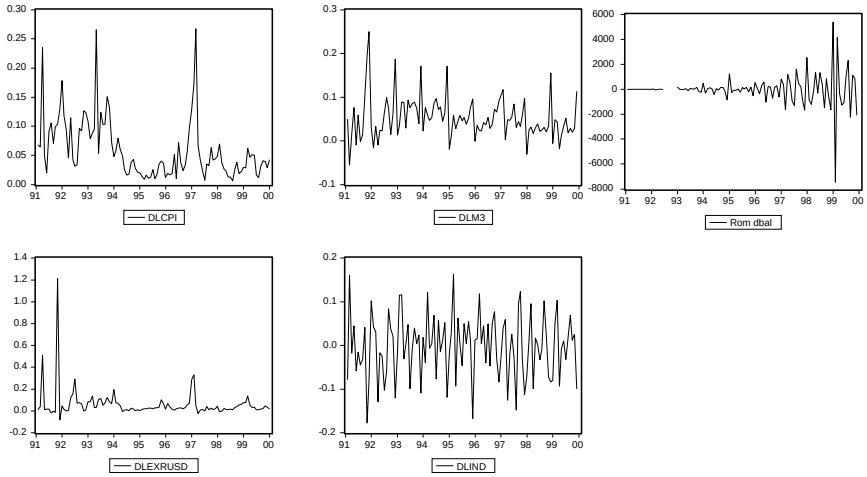


Figure 6 Russia: First Differences

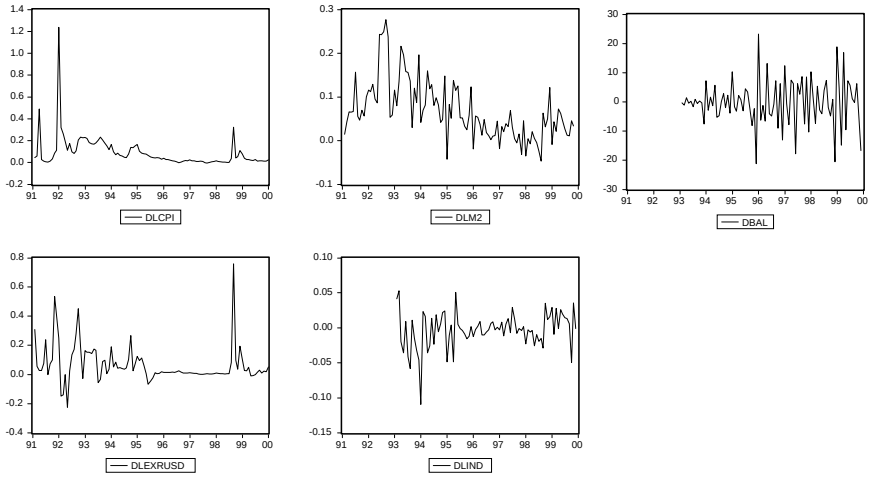


Figure 7 Bulgaria: Balance and Normalised Balance (bal/cpi)

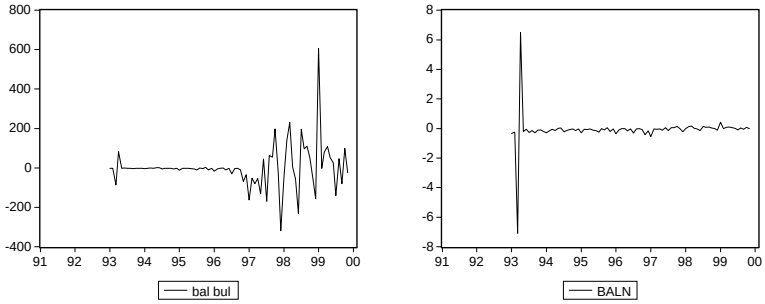


Figure 8 Romania: Balance and Normalised Balance (bal/cpi)

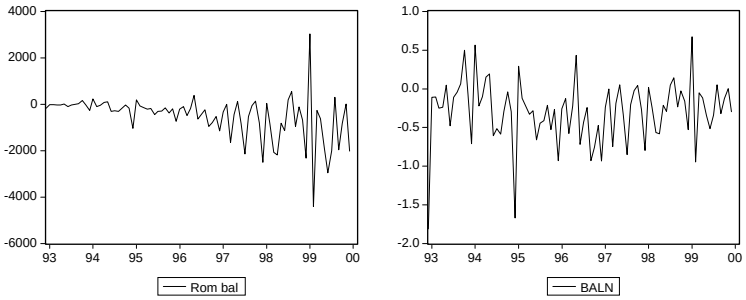


Figure 9 Russia: Balance and Normalised Balance (bal/cpi)

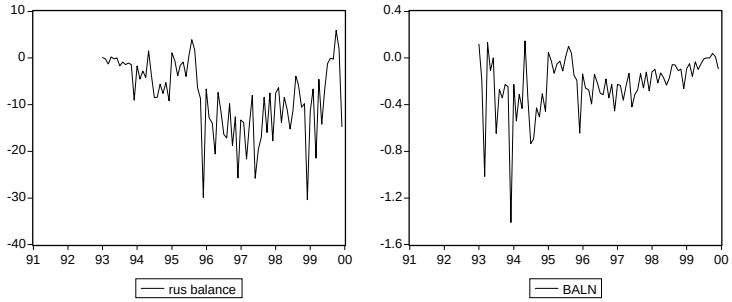


Figure 10 Bulgaria: Impulse Responses, Model 1

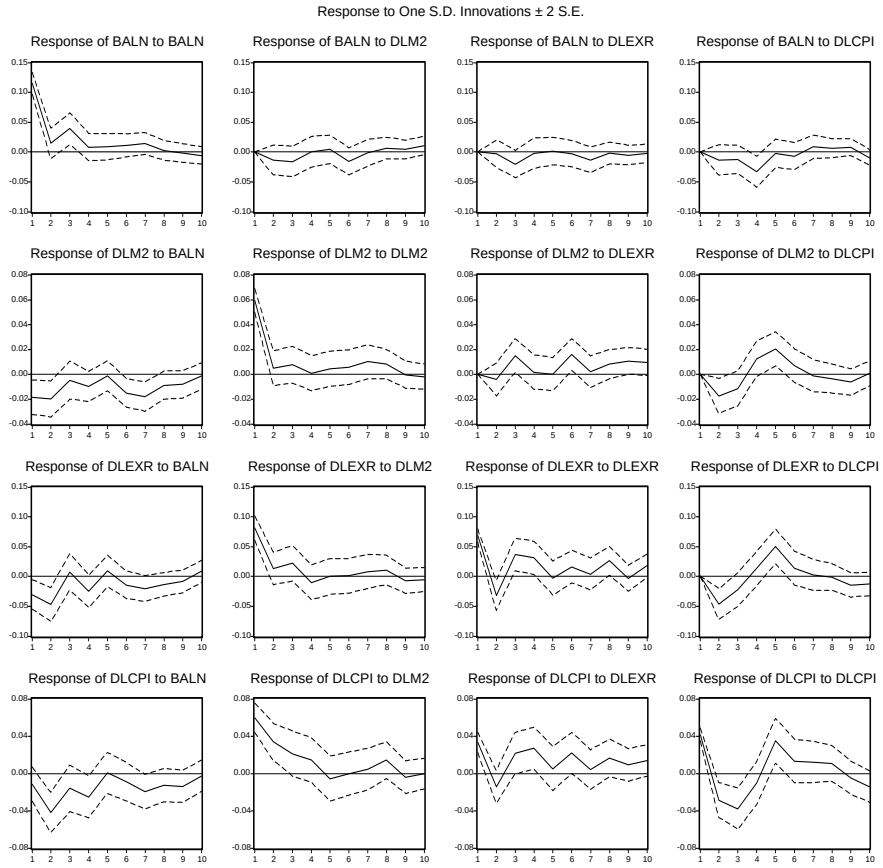


Figure 11 Bulgaria: Variance Decomposition, Model 1

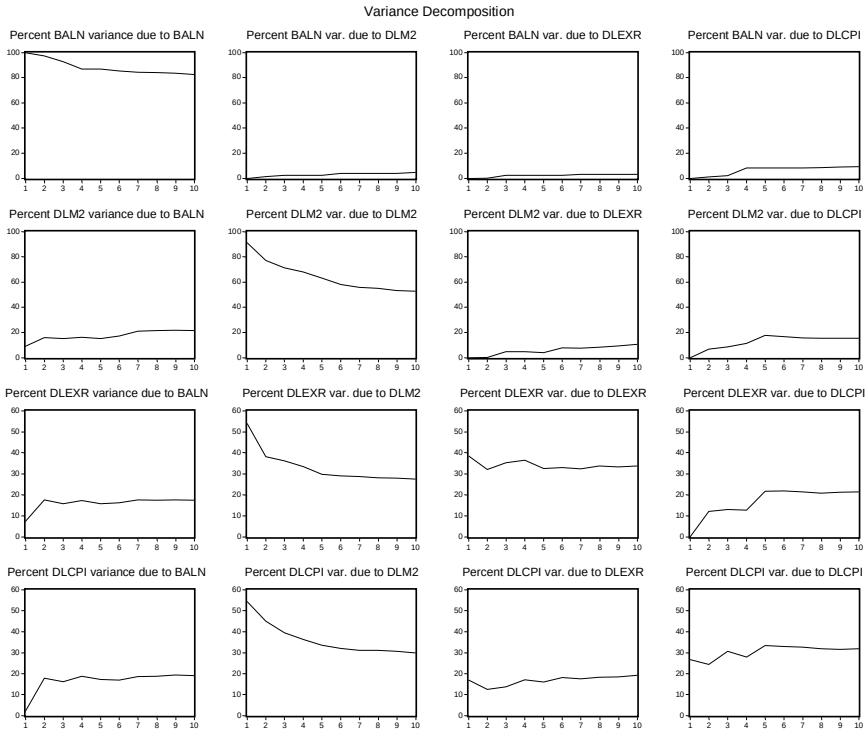


Figure 12 Bulgaria: Impulse Responses, Model 3

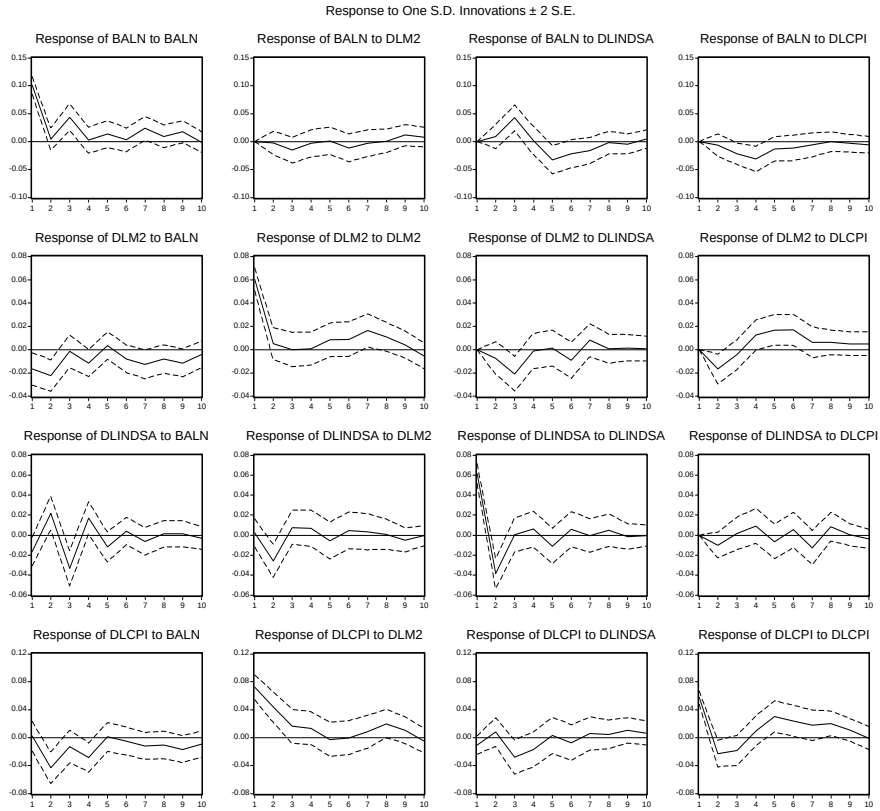


Figure 13 Bulgaria: Variance Decomposition, Model 3

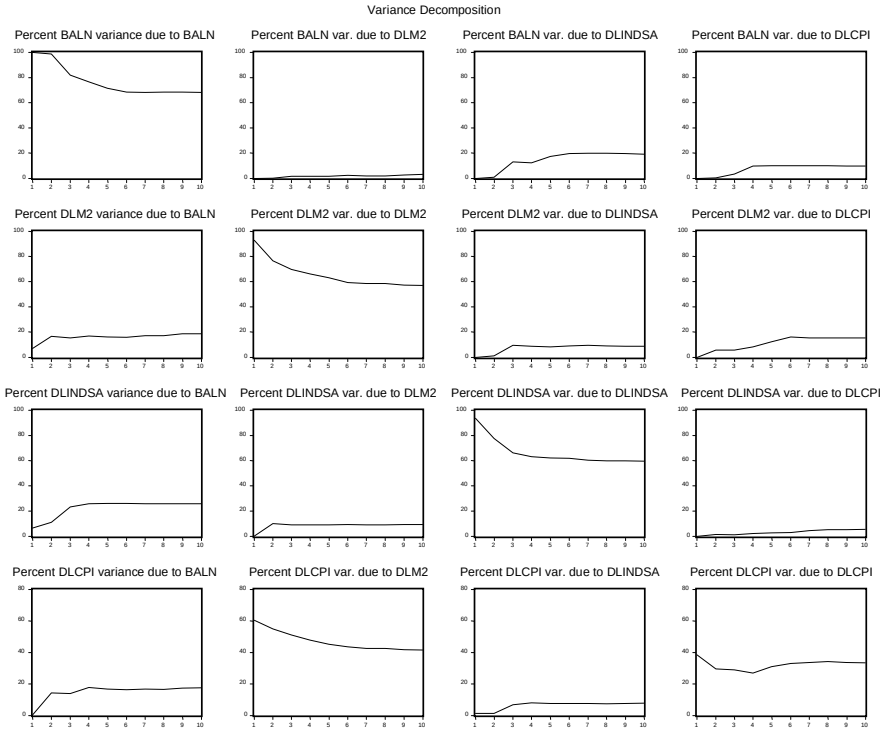


Figure 14 Bulgaria: Forecast Analysis for Prices

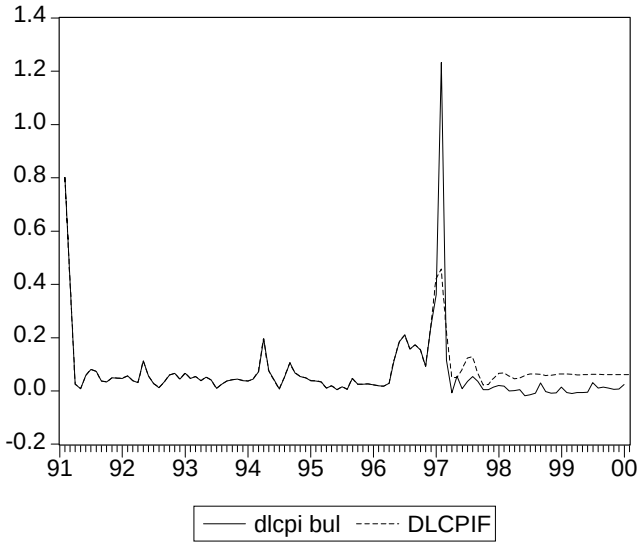


Figure 15 Romania: Impulse Responses, Model 1

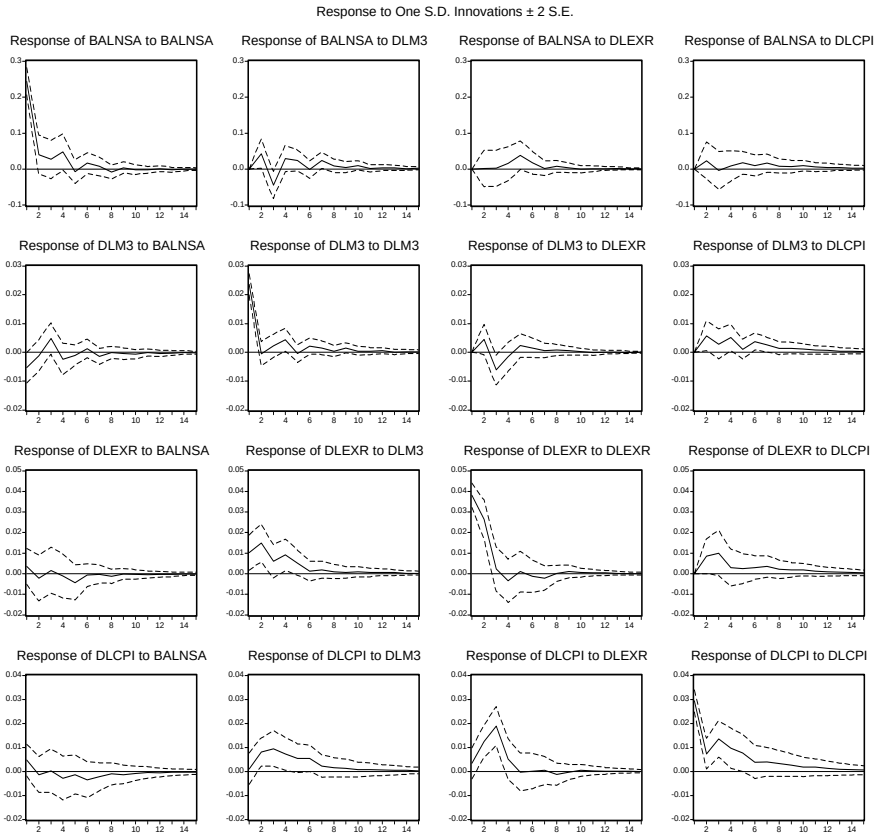


Figure 16 Romania: Variance Decomposition, Model 1

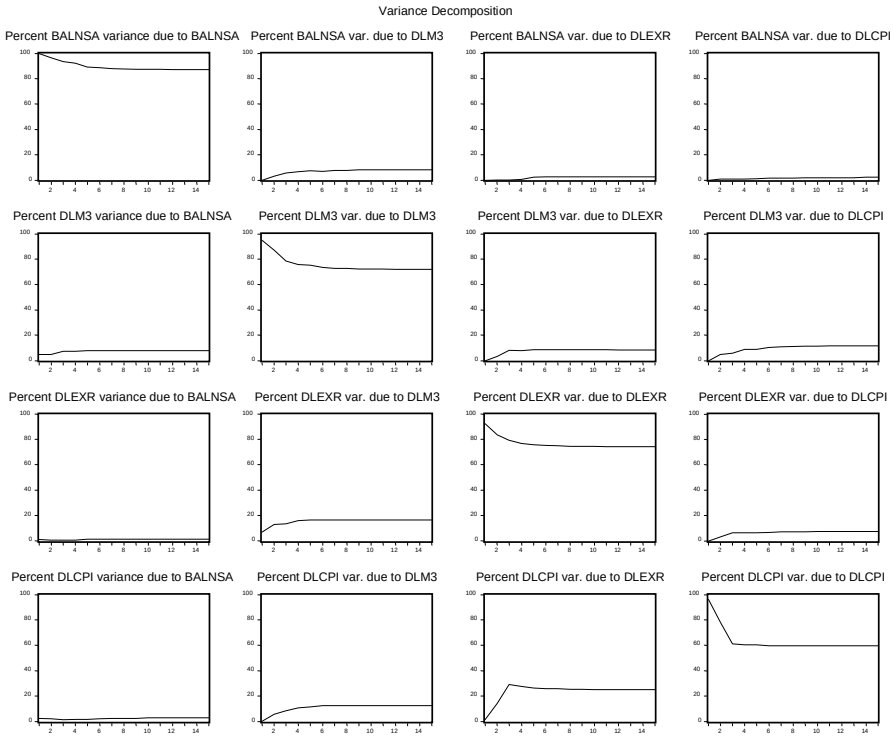


Figure 17 Romania: Impulse Responses, Model 3

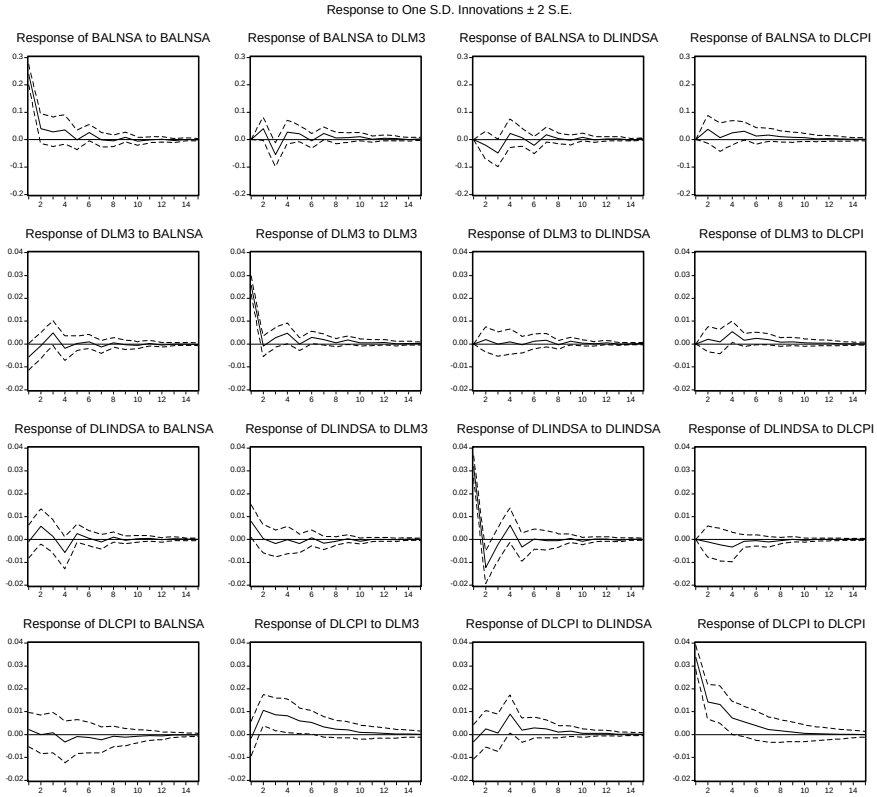


Figure 18 Romania: Variance Decomposition, Model 3

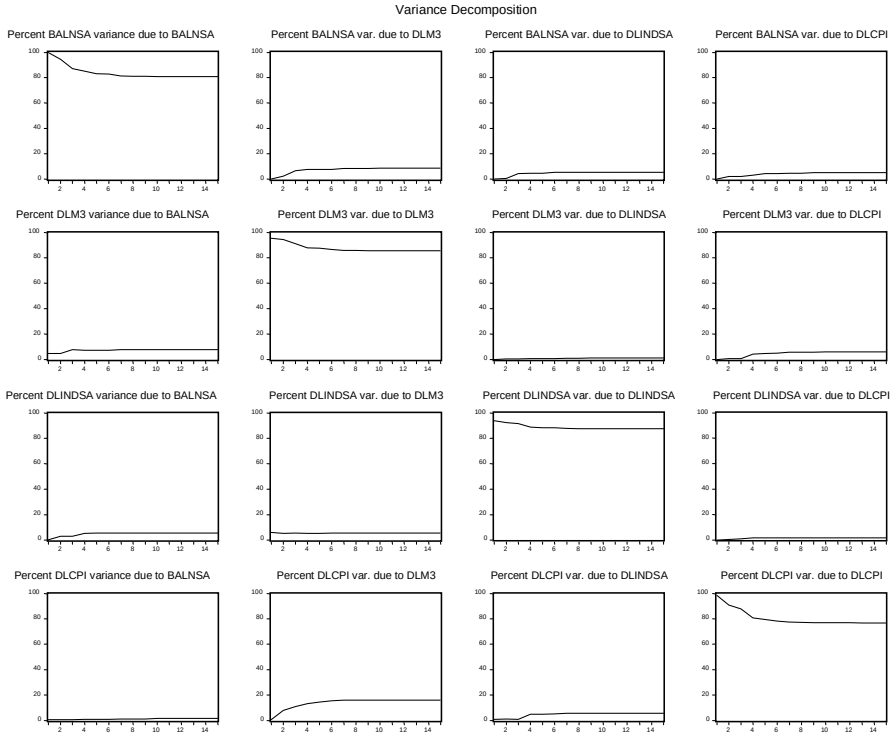


Figure 19 Russia: Impulse Responses, Model 1

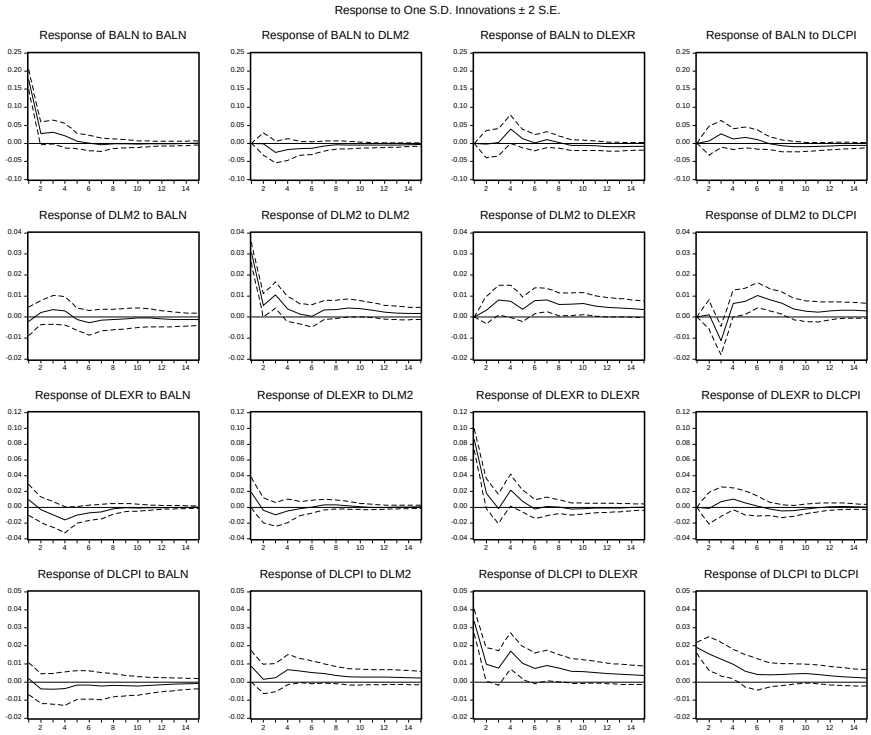


Figure 20 Russia: Variance Decomposition, Model 1

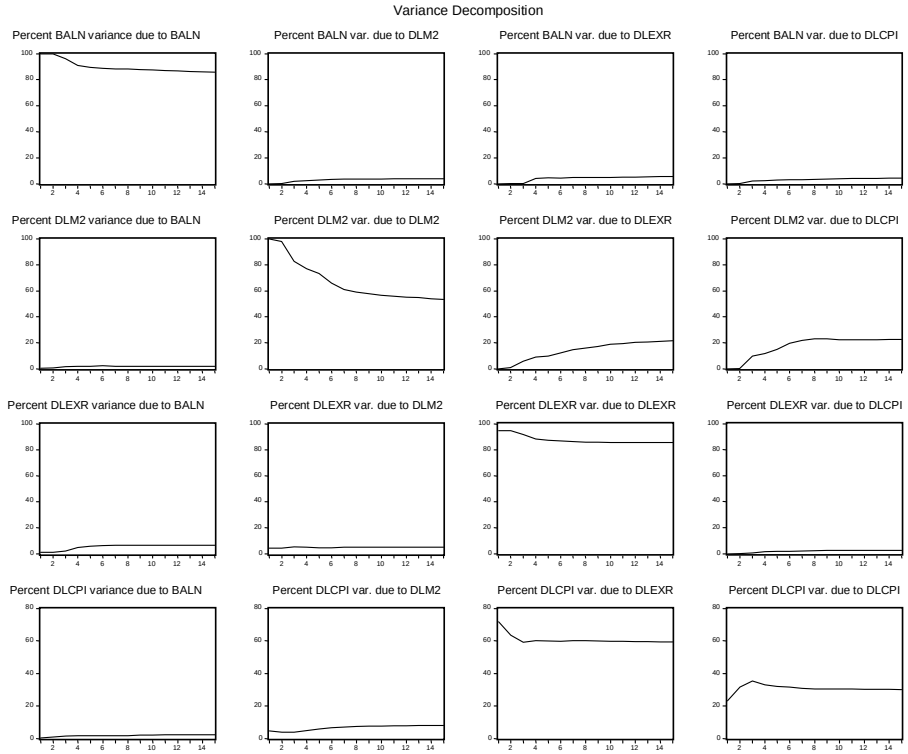


Figure 21 Russia: Impulse Responses, Model 3

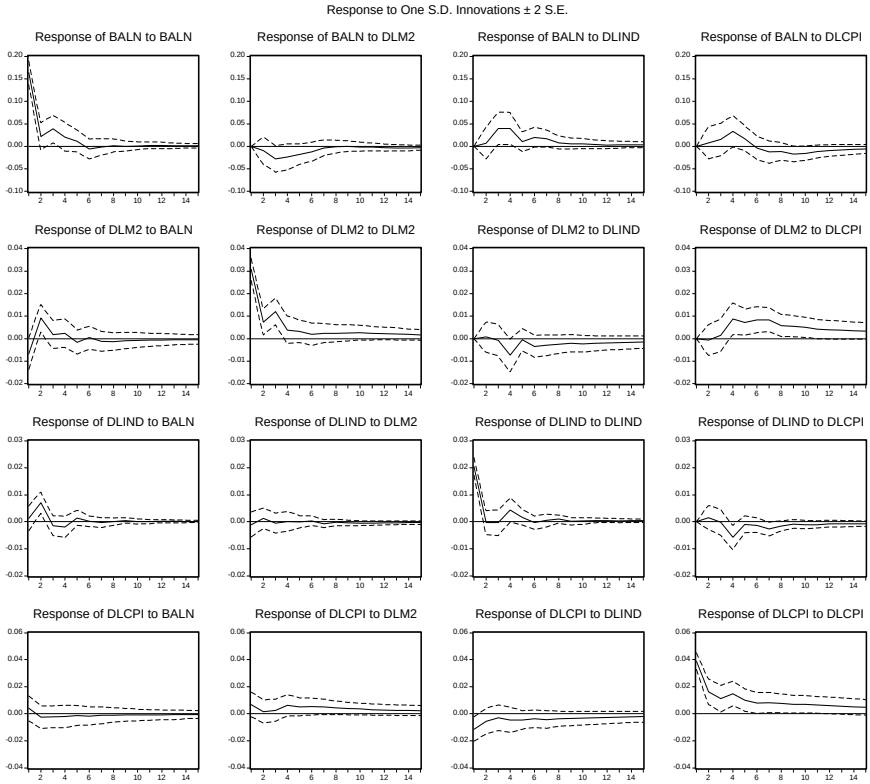


Figure 22 Russia: Variance Decomposition, Model 3

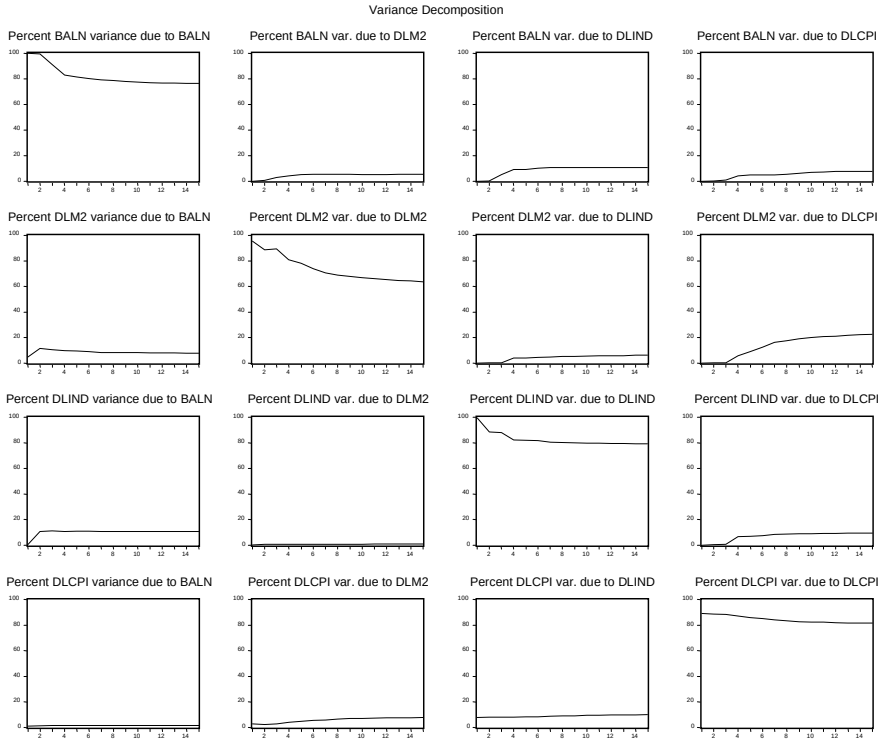
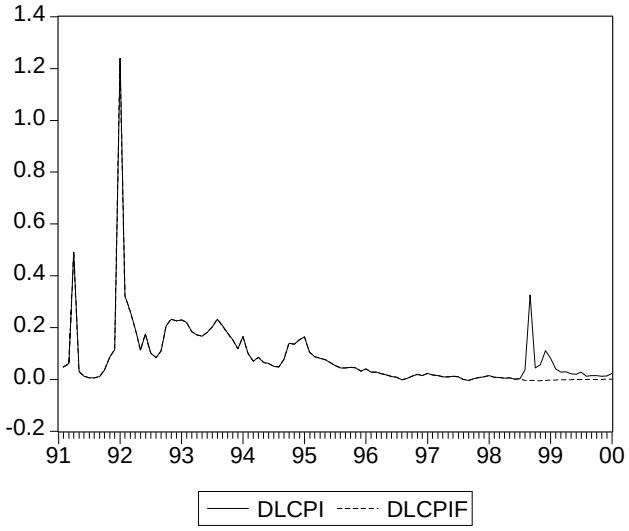


Figure 23 Russia: Forecast Analysis for Prices



Notes

* We are grateful to Matti Virén and seminar participants in the Bank of Finland for helpful comments. The opinions expressed in this paper are those of the authors and do not necessarily reflect those of the Bank of Finland.

[1] Other candidates for the analysis include the Czech Republic, Hungary and Ukraine. For the Czech case, however, the fiscal theory seems to be a poor explanation as fiscal policy in the region has almost been balanced.

[2] Cochrane (2000) makes a conceptual point that the second equation is not a budget constraint, but a government valuation equation.

[3] Ross considers regression in first-differences without error-correction terms, while Brada and Kutan use difference-stationary and trend-stationary models.

[4] These results are available from the authors upon request.

[5] In addition, we attempted to address the issue whether the central bank financing of the deficits was a crucial determinant for inflation by introducing a proxy of a share of balance monetised (difference in increase in narrow money supply divided by fiscal balance) and included this term in the VAR model. It appears that this measure is not a very good proxy for the actual central bank financing of the deficits, and, hence, it did not change our main findings (c.f. also the discussion in section 5).

[6] For example, monetary shocks could have only temporary effects, but there is little basis to suggest that fiscal shocks would have permanent effects.

[7] For early Russian fiscal data, we augmented the database with Goskomstat data.

[8] Except for the fiscal balance.

[9] We also smoothed the fiscal series with the Hodrick-Prescott filter to get a figure that would capture a longer-term trend in the fiscal data and conducted all regression analysis with this alternative method. The results concerning the impulse response and variance decomposition analysis remained essentially the same, regardless of the smoothing method of the fiscal series. As the normal X11 method requires weaker modifications of actual data, only the results with the X11-adjusted series are reported.

[10] We also checked an error-correction formulation for Russia. However, the results of the impact of fiscal balance are not significantly better than those reported in the simple first-differences specification. There are some severe problems in the regression results, such as the existence of a wrong sign for the response of prices to money. However, these results are not presented here.

[11] Information criteria, such as AIC, seem to recommend even shorter lag structures.

[12] For these, see the discussion in Section 5.

[13] Clearly, fiscal balance can also affect prices due to the fact that a portion of the fiscal budget is financed by the cost of printing money. We discuss this issue in more detail in Section 5.

[14] Lag length sufficient to remove residual autocorrelation is again, 6.

[15] We did not consider regime change possibilities for Romania because the Chow tests did not detect significant breakpoints in the price equation of the VAR during the Romanian crisis (1997:1, 2 or 3).

[16] For the Russian case, we also estimated a vector error correction model (see footnote 7) and an unstructural VAR with fiscal balance replaced by a fiscal balance based on a percentage of GDP. The results from the latter specification did not change the conclusions concerning the impacts of fiscal balance on inflation.

[17] This endogeneity issue can also be examined from the impulse response analysis. The problem may in fact be smaller than expected, because (perhaps with the exception of Bulgaria) the share of variance decomposition in the money variables explained by fiscal deficits is surprisingly small.

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