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FISCAL MULTIPLIERS IN ROMANIA

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Abstract. Using various methods for identifying the econometric model, I estimated the impact and cumulative fiscal multipliers in order to measure the effects of fiscal policy to the real economy. The results come in line with the economic theory and the studies in this field, as, Romania's economy being relatively small, open and with a flexible exchange policy, one cannot expect multipliers to be significant in size. Thus, we can conclude that, based on all the methods applied for calculating fiscal multipliers, they will have low values, even if sometimes the impact multipliers tend to have relatively higher values, these values being determined by a higher initial amplitude, but which is not transferred to the real economy, and is followed by a rapid decrease in their magnitude.

1. Introduction

During the period preceding the financial crisis, the fiscal policy and its impact on the economy were not of much interest for the relevant decision bodies. Moreover, the monetary policy was regarded as a more precise and easier to use instrument, but which, according to my personal studies, is no longer used in the post-crisis period with the same priority as it was in the ante-crisis period. Following the study I conducted in my Bachelor's Thesis[1], I reached the conclusion that the transmission mechanism between the monetary policy interests and the interbank market interests is far from being homogenous and, furthermore, the spreads among the two have a tendency to increase once the maturity increase. One major difference – which in the past favoured the monetary policy –between the two types of policies, monetary and fiscal, is the time gap between the moment the decision is taken, the moment the decision is implemented and the moment when the impact of the fiscal measures is felt, as there are inherent disparities between those moments. Because of the fact that the power and capability of the monetary policy to counter the recession were overwhelmed by the severity of the financial crisis, there was growing interest for researching the role of the fiscal policy, as most of the developed economy countries adopted fiscal policy incentivizing measures in their attempt to stabilize their economies. In turn, most of the underdeveloped or emerging economies were forced to reach for aggressive/restrictive packages for fiscal consolidation, as a consequence of a decrease in the financing capacity, and, at the same time, the existence of major imbalances caused by adopting procyclical fiscal policies in the economic expansion/boom period.

Same thing can be find in Romania, just as in many other countries, the main consequence of the procyclical fiscal policy adopted in the period of economic expansion until 2008 was an overheating of the economy, which deepened the destabilizing of budget balances. This procyclical character of the fiscal policies adopted by the decision makers also has another

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This paper is in final form and no version of it will be submitted for publication elsewhere.

[1]Voinescu Vlad (2014), "Mecanisme de transmisie a politciimonetare", Bachelor's Thesis

negative role, as it annuls the role and effect of the automatic stabilizers, meant to naturally balance the economy

For this purpose, in order to measure the impact of the fiscal policy on the real economy, one must research, calculate or estimate the so called fiscal multipliers. The fiscal multipliers are based on a concept forwarded by Richard Kahn in 1931 - a student of John Maynard Keynes - and they are used in order to quantify the effect of fiscal measures on the GDP (distinguishing among various income and expenditure categories). In other words, they measure the sensitivity of GDP to the alteration of an income or expenditure item from the general consolidated budget.

The paper is structured in four main sections including introduction, literature review, data and methodology, estimation results and conclusions. In the section which presents estimation results we can find all the identification methods of the structural VAR model (Choleski decomposition, triangular decomposition, Blanchard&Perotti method, identification based on sign restriction and on the restriction of monetary impact policy) used in the computation of fiscal multipliers.

2. Literature Review

The specialized literature defines short term fiscal multipliers, and also long-term and medium-term multipliers. On the short term, the size of multipliers reflects the immediate impact of a fiscal-budget measure on the GDP, while, on the medium and long term, the second-round effects are taken into consideration, as they trigger alterations in the behaviour of various economic operators (such as households and/or companies). Medium and long term fiscal multipliers cumulate the short term effect on the GDP for each relevant period, in orderto gauge the full effect, over the whole interval, of the policy change on the macroeconomic environement.

Antonio Spilimbergo, Steve Symansky and Martin Schindler (2009) and Pritha Mitra and Tigran Poghosyan (2015)[2] presented in their article various fiscal multipliers, taking into consideration the different dimensions (expenditure, income, different time frames)[3]:

(1) Expenditure impact multiplier ($\frac{\triangle y(t)}{\triangle g(t)} * \frac{\overline{Y}}{\overline{G}}$)
(2) Income impact multiplier ($\frac{\triangle y(t)}{\triangle r(t)} * \frac{\overline{Y}}{\overline{R}}$)
(3) Expenditure cumulativemultiplier ($\frac{\sum_{i=0}^{N} \triangle y(t+i)}{\sum_{i=0}^{N} \triangle g(t+i)} * \frac{\overline{Y}}{\overline{G}}$)
(4) Income cumulative multiplier ($\frac{\sum_{i=0}^{N} \triangle y(t+i)}{\sum_{i=0}^{N} \triangle r(t+i)} * \frac{\overline{Y}}{\overline{R}}$)

The cumulative multiplier is considered to be the best tool for estimating the effects that the fiscal policy has on the GDP because this indicator measures the overall effect of the fiscal measures, not just at every certain moment how the impact multipler captures.

The size and even the sign of the fiscal multipliers is a controversial issue in the economic literature and practice, as the various points of view reflect the ideological gap between the various political ideologies. Thus, the opinions of the economists adopting the left-wing ideology (keynist or neo-keynist) assigns higher values to the fiscal multipliers, which makes the fiscal policy more efficient in modifying the GDP. Classical and neo-classical economists believe that the fiscal policy is not efficient and, therefore, the corresponding multipliers have low values, and even the values of the multipliers are negative. Most of the studies conclude that the size of the fiscal multipliers in the emerging economies is very small or even insignificant (Ilzetzki et al. [2011], Espinoza and Senhadji [2011], Gonzalez−Garcia et al. [2013]) and it depends on structural parameter such as the openness, the exchange rate policy or the debt ratio (R.Stanca et al. sums up in a 2013 study). Regarding studies on developed economies, Glocker, Sestieri

[2]The obtained impulse response functions (IRFs) are elasticities measuring the percentage change in output in response to one percentage point change in fiscal variables. To convert these elasticities to multipliers, we adjust IRFs by the average ratios of the respective fiscal variable and GDP.

[3]Please note that lower case letters denote logarithms and superscripts denote sample averages of respective variables.

and Towbin (2017) found that multipliers are normally below one in expansions and above one in recessions.

Moreover, in the estimates for Romania, the size of the multiplier is confirmed as being very small, and in some cases they are insignificant from a statistical point of view (only the expenditure multiplier is significant from a statistical point of view and it has a value of about 0.1 – very low). The study concludes that the results of the investigation are in line with the conclusions of other studies regarding states from the CEE (Cuaresma et al [2011], Muir and Weber [2013], Ilzetzky et al [2011]) and they seem to confirm the implications of the standard Mundell-Fleming model – the fiscal policy is relatively lacking in efficiency in smaller and open economies, with a flexible exchange rate. On the other hand, a study conducted by Anca Stoian (2012) shows the fact that the expenditure multiplier varies around the value of 0.25 – a relatively higher value, but still low in comparision with the values computed for other countries.

3. Data and Methodology

In this paper I tried to observe the impulse response functions of five macroeconomic variables and, based on them, I calculated the fiscal multipliers found in the Romanian economy, by using the cumulative ones as main multipliers measure.

In making the calculation I used the following data[4], following the data processing methodologies of Perotti (2005) and Caldara and Kamps (2008):

(1) l_y – logarithm of quarterly real GDP per capita
(2) l_g – logarithm of quarterly real public expenditures[5] per capita
(3) l_r – logarithm of quarterly real net public income[6] per capita
(4) i – quarterly average of the BUBOR12M interest rate
(5) hipc_pi – inflation rate[7]

All data was adjusted each season by using the Eviews 7 program, with the Census X11 adjustment method. The logarithmic values were multiplied by 100 (after some of them – the macroeconomic variables per capita (thousands of persons) – were previously multiplied by 1000, in order to bring the values to the level of an active employee from the economy) in order to calibrate the results.

With the consent of authors Dieppe, Legrand and van Roye[8], I used for estimations the BEAR toolbox (dedicated for the Bayesian autoregressive vectors) included in the Matlab program.

In order to conduct this study, I applied several methodologies for identifying and techniques of estimating the models. I tried to estimate a structural VAR model, by using several identification algorithms[9], such as the Cholesky decomposition, triangular decomposition, identification based on sign restriction and on the restriction on the impact of the monetary policy, as well as an identification algorithm used by Blanchard and Perotti (2002) and expanded by Perotti in 2005. At the same time, for the last identification algorithm (Blanchard-Perotti) I used the methodology suggested by Caldara and Kamps (2008) and the values are adapted to Romania using Altăr, Necula and Bobeică (2010) approach.

I started from the simple form of a VAR, described by the endogenous variable vector (Y_t – size $k \times 1$), the lag polynomial matrix ($C(L)$ – size $k \times k$) and the vector of independent and identically distributed errors in the reduced form (U_t – size $k \times 1$):

[4]The data sample is 1998Q1-2017Q2; Data source: Eurostat and National Bank of Romania.

[5]Expenditures are determined as the sum of wage expenditures, intermediate consumption and gross fixed capital formation.

[6]Net income is determined as the sum of incomes from direct and indirect taxes and social contributions minsu the sum of incomes from social transfers and subsidies.

[7]Inflation ratio is bases on the year-on-year CPI (CPI / CPI(-4) *100-100).

[8]Alistair Dieppe, Romain Legrand, Bjorn van Roye (2015), "The Bayesian Estimation, Analysis and Regression (BEAR) Toolbox" v2.3, External Developments Division, European Central Bank.

[9]Presented in the Estimation Results section.

$$Y_t = C\left(L\right) Y_{t-1} + U_t,\ t = 1, \ldots, T$$

By multiplying this reduced form by the A_0 matrix (size $k \times k$) we get:

$$A_0 Y_t = A_0 C\left(L\right) Y_{t-1} + \ Be_t$$

$Be_t = A_0 U_t =$ the relation between the structural errors and the reduced form errors

In this manner we reach a so called AB model. The SVAR model is not identified without restrictions for the A_0 and B matrices.

4. Estimation results

4.1. **The Choleski decomposition.** This system identification method involves restricting the B matrix as being the identity matrix with size k, and the A_0 matrix as being a matrix where the elements on the main diagonal equal one, the ones above the diagonal equal zero, while below the diagonal we encounter the contemporary relations between the input variables. This type of decomposition is equivalent, as it imposes short term restrictions; it systematizes the variables in such a manner that all variables coming after the analysed variable no longer has a contemporaneous impact (during the same quarter) on the respective variable. For example, the other variables do not have contemporaneous impact on the first variable, and all the others have contemporaneous impact on the last variable. Following the observation of all the economic phenomena and links between the variables being used, I decided to set them in the following order: expenditures, GDP, inflation, income and interest rate. The model is stable, according to the characteristic polynomial roots tests, all of them falling within the (0,1) interval.

Therefore, the relation between the "u_t" reduced form errors and the "e_t" structural errors:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -a_{y,g} & 1 & 0 & 0 & 0 \\ -a_{hicp,g} & -a_{hicp,y} & 1 & 0 & 0 \\ -a_{r,g} & -a_{r,y} & -a_{r,hicp} & 1 & 0 \\ -a_{i,g} & -a_{i,y} & -a_{i,hicp} & -a_{i,r} & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^{hicp} \\ u_t^r \\ u_t^i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_t^g \\ e_t^y \\ e_t^{hicp} \\ e_t^r \\ e_t^i \end{bmatrix}$$

I chose to place the expenditures first, because the movements in this variable do not comprise such a big cyclical component as the income and, therefore, they are not subject to contemporaneous impact from the shocks in the private sector. Also, placing the GDP and the inflation before the income could be justified by the fact that shocks on these two variables placed at the top have immediate impact on the taxation base, and so we notice a large cyclical component of income. Choosing to place last the interest rate is a result of the fact that the Central Bank reacts based on the existing macroeconomic situation, and with income and expenditures being defined as net, we believe they are not influenced by the interest rate.

In order to conduct this case study I used the methodology proposed by Blanchard and Perrotti (1999)[10]. It consists of a structural autoregressive vector based on institutional information referring to the fiscal system, the transfer system and the tax collection periods, in order to be able to identify the size of fiscal multipliers. The presence of exogenous fiscal shocks and the existence of a delay in implementing fiscal measures, more precisely, the delay between moment the measure is applied and its effects in the economy.

In order to identify the system by using this method I used, on the one hand, the BEAR Toolbox and, on the other hand, the VAR estimate in Eviews, and I obtained the same results. Also, I calculated the variation decomposition. The complete results are presented in Appendix 1.

[10]Blanchard and Perrotti (1999), "An empirical characterization of the dynamic effects of changes in government spending and taxes on output", NBER Working Paper No.7269

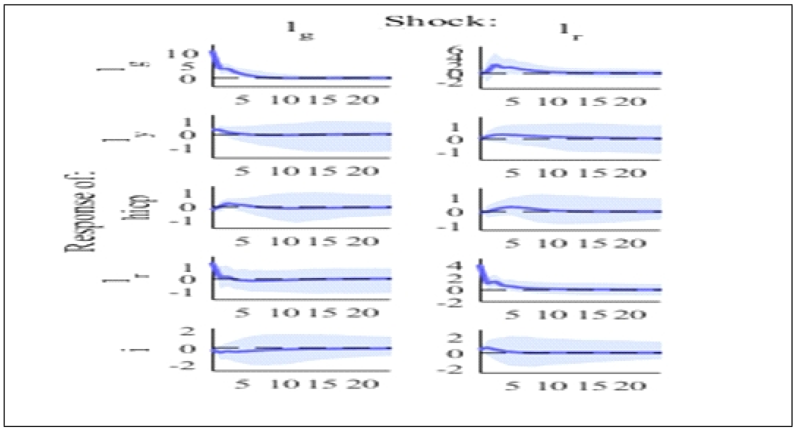

Fig.1.1. IRFs of all variables to fiscal shocks

The answers to income and expenditures impulses (Fig. 1.1.) are extremely weak according to the identification of the model with the Choleski method.

Table 2.1.						
Time (quarter)	1	4	8	12	20	24
Expenditure impact multiplier	0.056	0.068	-0.209	1.036	2.034	1.721
Expenditure cumulative multiplier	0.056	0.075	0.064	0.057	0.063	0.071
Income impact multiplier	*	0.545	1.043	1.155	1.094	1.095
Income cumulative multiplier	*	0.088	0.227	0.300	0.368	0.385

* the values become insignificant, as the answer to impulse of the income in the case of a budget income shock is not statistically different from zero and thus we have a denominator which is very close to 0.

The cumulative multipliers obtained through this method (Table 2.1.) are extremely low; even if the income cumulative multiplier grow over the period of 20 quarters, they are not significant from an economic point of view. The impact multipliers only become greater after 8 (income) and 12 (expenditure) quarters, thus having the same unsatisfying result, but it is to be anticipated if we take into account Romania's economic particularities.

4.2. **Triangular decomposition.** This model identification method is very similar to Choleski decomposition, one of the differences being the fact that matrix B is no longer restricted to being the identity matrix of order k, therefore, the standard deviation of structural errors is no longer 1. Apart from the restrictions imposed in the Choleski decomposition, regarding the contemporary interdependencies among the variables, we can add here the unitary contemporary response of a variable to its own shock. The model is stable according to the characteristic polynomial roots test, all falling in the (0,1) interval.

The responses to the expenditure increase or income decrease impulses obtained by using this method are detailed below, and the complete results are presented in Appendix 1, together with the variance decompositions.

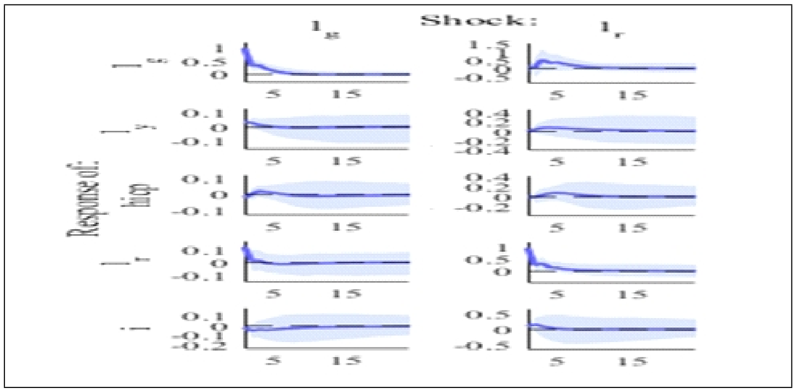

Fig.1.2. IRFs of all variables to fiscal shocks

As regards the response of variables (Fig.1.2.) to a shock in the expenditure variable, one can notice, just as Caldara and Kamps (2008) state, that the results are almost the same as the ones obtained with the previous method. As regards the shock on income, one cannotice that the response of expenditures is a little higher, but not significantly higher, than the one calculated through the Choleski identification method.

4.3. **Blanchard&Perotti (2002).** This identification method is based on the studies of Blanchard and Perotti (2002) and the expansion made by Perotti (2005). The first article uses a methodology with only 3 endogenous variables, while Perotti expands it to 5 variables, and this is also the manner in which I am using it. This identification algorithm used by the two authors is based on institutional data regarding the fiscal system and the tax collection periods in order to identify the automatic response of income and expenditures to the economic activity. In the first part, they use the economic information in order to calculate cyclically adjusted income and expenditures and then they estimate fiscal shocks. By adapting the identification algorithm to my context the equation Bet = A0Ut presents the following relations between the "ut" reduced form errors and the "et" structural errors:

$$u_t^g = a_{g,y}u_t^y + a_{g,hicp}u_t^{hicp} + a_{g,i}u_r^i + \beta_{g,r}e_t^r + e_t^g$$

$$u_t^r = a_{r,y}u_t^y + a_{r,hicp}u_t^{hicp} + a_{r,i}u_t^i + \beta_{r,g}e_t^g + e_t^r$$

$$u_t^y = a_{y,g}u_t^g + a_{y,r}u_t^r + e_t^y$$

$$u_t^{hicp} = a_{hicp,g}u_t^g + a_{hicp,y}u_t^y + a_{hicp,r}u_t^r + e_t^{hicp}$$

$$u_t^i = a_{i,g}u_t^g + a_{i,y}u_t^y + a_{i,hicp}u_t^{hicp} + a_{i,r}u_t^r + e_t^i$$

Even with these restrictions, the sign is not identified. The variance-covariance matrix has 10 distinct elements, while the equation system has 17 parameters. For the other 7 restrictions Blanchard and Perotti calculate the cyclically adjusted income and expenditures and the elasticities of income and expenditures in relation to the GDP.

This particular identification has the following specifications: GDP does not have a contemporaneous reaction to the shocks of inflation and the interest rate, but it is subjected to contemporaneous impact from shocks on income and expenditures. Also, we believe that the inflation rate has a contemporaneous reaction to the shocks on GDP, income and expenditures, but it is not affected by shocks on interest rate. The interest rate is considered to be subjected to contemporaneous impact from all shocks in the system. Perotti (2005) sets the parameter $\beta_{g,r} = 0$, and, as a consequence, we believe that the decisions of the government regarding expenditures are taken before the ones regarding income.

The u_t^r and u_t^g inovations can be seen as a linear innovation of three types of shocks: the first are automatic stabilizers – the automatic response of governmental income and expenditures to GDP shocks, inflation and interest rates; the second is the discretionary response of the shock fiscal policy in macroeconomic variables and, the third, structural shocks between e_t^r and e_t^g. Taking into account the fact that decision makers take more than a quarter to adopt and implement fiscal measures, that means that the u_t^r and u_t^g inovations only reflect the activity of automatic stabilizers, not the one of the discretionary policy. This delay is caused, on the one hand, by the fact that decision makers take very long to notice a shock (for example, the estimated GDP almost never equals the actual GDP, and negatives shocks can hide here) and, on the other hand, the bureaucratic and political procedures that any measure has to be subjected to.

The other restrictions are as follows: the GDP does not affect government expenditures, as the data construction was made in such a manner so as to exclude the cyclical component from the expenditures ($a_{y,g} = 0$). The GDP elasticity in relation to the income resulted from income taxes is positive, and the latter, in relation to the social transfers is negative. The GDP elasticity in relation to subsidies is 0, as this element is only budgeted once a year, before the draft budget is subjected to the approval of the decision makers. The elasticities are calculated in accordance with Altăr, Necula and Bobeică (2010), and are then weighted and summed in accordance with Perotti (2005), following this formula:

$$a_{r,y} = \sum_t \varepsilon_{T_{j,y}} \frac{T_j}{T}$$

where: $a_{r,y}$ = income elasticity in relation with GDP; $\varepsilon_{T_{j,y}}$= elasticity of an income component (with "+" if the income is from taxes and contributions, with "-" if it regards transfers); $\frac{T_j}{T}$ = the quantitative share of the income category in the total income.

Therefore, after making all the calculations we obtained the following system:

$$\begin{bmatrix} 1 & 0 & 0.44 & 0 & 0 \\ -a_{y,g} & 1 & 0 & -a_{y,r} & 0 \\ -a_{hicp,g} & -a_{hicp,y} & 1 & -a_{hicp,r} & 0 \\ 0 & -1.82 & -0.93 & 1 & 0 \\ -a_{i,g} & -a_{i,y} & -a_{i,hicp} & -a_{i,r} & 1 \end{bmatrix} \begin{bmatrix} u_r^g \\ u_r^y \\ u_r^{hicp} \\ u_r^r \\ u_r^i \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ \beta_{r,g} & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_r^g \\ e_r^y \\ e_r^{hicp} \\ e_r^r \\ e_r^i \end{bmatrix}$$

By using this data I computed the response impulses for 24 quarters and I obtained the following results: (the complete results are presented in Appendix 1). The model is stable, in accordance with the characteristic polynomial roots test, all falling within the (0,1) interval.

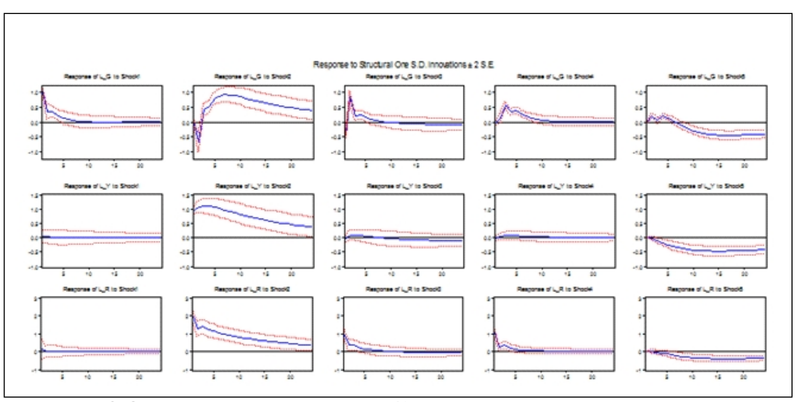

Fig 1.3. IRFs of fiscal variables and GDP to shocks in all variables used in computation. Shock 1 – shock on expenditures; shock 2 – shock on GDP; shock 3 – shock on inflation rate; shock 4 – shock on revenues; shock 5 – shock on interest rate.

One can notice (Fig.1.3.) that the expenditure responses to a GDP shock have a positive reaction during the first year, and reach their maximum after approximately two years. As regards the expenditure response to an inflation shock, it is positive on the short term, but, after the first quarter it becomes negative.

As regards the fiscal multipliers calculated by using the results of the Blanchard and Perotti method (Table 2.2.), we get the same low results for cumulative multipliers, while the impact multipliers are higher, but still not high enough in order to have a real effect on the economy.

Table 2.2.						
Time (quarter)	1	4	8	12	20	24
Expenditure impact multiplier	0.057	0.071	-0.199	1.022	2.034	1.721
Expenditure cumulative multiplier	0.057	0.077	0.066	0.059	0.065	0.073
Income impact multiplier	-0.017	0.485	0.978	1.088	0.870	0.621
Income cumulative multiplier	-0.017	0.100	0.199	0.245	0.277	0.280

4.4. **Sign restrictions.** This identification algorithm no longer requires the number of shocks to be equal to the number of variables and no contemporaneous effect restrictions must be imposed between the reduced variables and the structural ones. Mountford and Uhlig (2005) impose restrictions directly on the responses to impulse and they identify four shocks: a business cycle shock, a fiscal monetary shock and shocks of budget income and expenditures. I will only impose three of these four shocks, as the results are not extremely sensitive to the monetary policy shock. Therefore, the sign restrictions I am imposing are the following: the business cycle shock is identified by imposing positive responses during the first 4 quarters of GDP and income. The income shock is identified through the need to get a positiveimpulse response for income to the first shock on the first 4 quarters, and the expenditure shock is identified through the positive impulse response to their own shock, to the first shock during the first 4 quarters. Both budget shocks are orthogonal to the business cycle shock.

Therefore, by following the Uhlig methodology (2005), we can define the relation between the reduced errors and the structural ones as follows:

$u_t = Be_t$, $E[u_t u_t\prime] = \Sigma u$ and $E[e_t e_t\prime] = I$

The implementation of the sign restriction identification scheme calls for the decomposition of matrix B into two components: $B = PQ$, where P is the Choleski factor of Σu, and Q has the following property: $QQ\prime = I$. The P matrix helps identify structural shocks, while the Q matrix contains the information on the existing sign restrictions, namely it notices induced shocks. The model is stable, as confirmed by the characteristic polynomial roots test, all falling within the (0,1) interval.

Below there is a table of the imposed sign restrictions:

	Public expenditure shock	GDP shock	Inflation shock	Public income shock	Monetary policy shock
Expenditures	+				
GDP		+			
Inflation					
Income		+		+	
Interest rate					

Thus, the variables' impulse response to the three identified shocks is presented below:

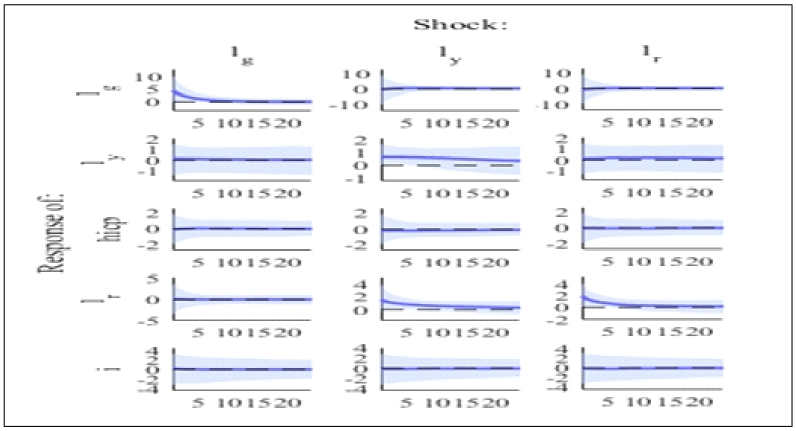

Fig. 1.4. IRFs of all variables to fiscal and GDP shocks

We notice (Fig.1.4) that the restrictions imposed are abided by, which proves that we can retain these data. Immediately after the four quarters subjected to sign restrictions have passed, all these become negative, which means that, in case of a business cycle shock, both the GDP and the income follow a descending trend after 5 quarters, the expenditures follow the same trend in the case of an expenditure shock and, also, the income decreases as a response to its own shock.

For this method, I also calculated the income and expenditures fiscal multipliers:

Table 2.3.						
Time (quarter)	1	4	8	12	20	24
Expenditure impact multiplier	0.053	0.118	0.250	0.401	0.882	1.205
Expenditure cumulative multiplier	0.053	0.074	0.097	0.119	0.150	0.164
Income impact multiplier	0.063	0.191	0.507	0.794	1.057	1.051
Income cumulative multiplier	0.063	0.110	0.190	0.261	0.375	0.416

The multipliers obtained (Table 2.3.) have lower values than the ones determined by using the other values.

4.5. **Sign restrictions plus impact restrictions.** In the case of this method, apart from the sign restrictions identified above, I also tried to impose a monetary policy zero impact represented by the interest rate for one quarter after shock. This inference was used, on the one hand, due to the fact that the monetary policy decisions register a certain delay because of the fact they need to be analysed and the decision makers have to take certain decisions and, on the other hand, the interest rate does not respond to fiscal shocks (income and expenditures shocks). The model is stable, in accordance whit the characteristic polynomial roots test, all falling within the (0,1) interval.

	Public expenditure shock	GDP shock	Inflation shock	Public income shock	Monetary policy shock
Expenditures	+				
GDP		+			
Inflation					
Income		+		+	
Interest rate	0			0	

The impulse responses following the shocks identified through the previous method, namely the business cycle shocks, the income and expenditures shocks, are presented in the following diagram:

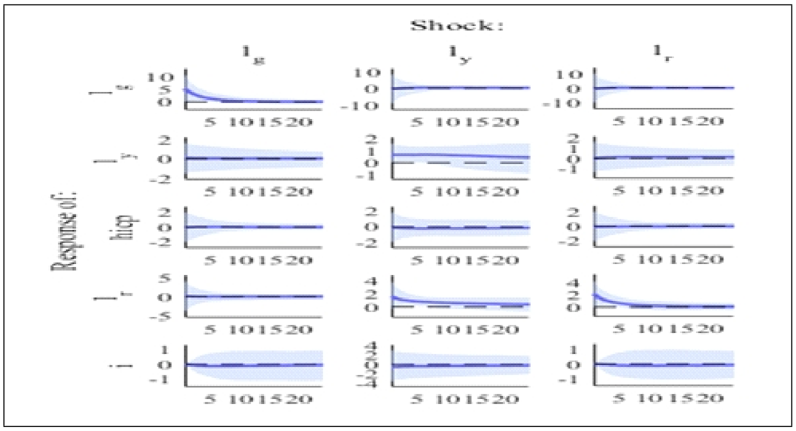

Fig.1.5 IRFs of all variables to fiscal and GDP shocks

We notice (Fig.1.5) that the restrictions imposed are abided by, which proves that we can retain these data. Immediately after the four quarters subjected to sign restrictions have passed, all these become negative, which means that, in case of a business cycle shock, both the GDP and the income follow a descending trend after 5 quarters. As regards the impulse response to their own shocks, expenditures and income follow the same descending trend.

By following the structure of the other methods, I also calculated in this case the cumulated and impact fiscal multipliers of income and expenditures:

Table 2.4.						
Time (quarter)	1	4	8	12	20	24
Expenditure impact multiplier	0.032	0.068	0.136	0.336	0.950	1.166
Expenditure cumulative multiplier	0.032	0.043	0.054	0.067	0.097	0.110
Income impact multiplier	0.001	0.108	0.323	0.549	1.151	1.190
Income cumulative multiplier	0.001	0.037	0.087	0.129	0.214	0.251

As regards the results of the multiplier (Table 2.4.), they are very low, even if we refer to the ones regarding expenditures (impact and cumulative), or to the ones regarding income (impact and cumulative). We notice that the impact ones have maximum values of 1.16 and 1.18, after 24 quarters (6 years!!), while the cumulative ones reach a maximum of 0.11 and 0.25, after the same period of time.

4.6. **Sign restrictions plus impact restrictions - Normal Wishart.** This is the same method as the previous one, only that matrices C(L) and ?u follow a Normal-Wishart distribution, meaning that the posterior ones will follow a Normal-Wishart distribution, such as the methodology is described in Caldara and Kamps (2008). The difference between this method and the previous ones that in the previous one the variance-covariance matrix contains fixed and diagonal elements, while, in the Normal-Wishart distribution, the elements of the same matrix are no longer only distributed diagonally and are no longer fixed.

The sign and impact restrictions on the monetary policy are the same as in the previous method: the business cycle shock is identified by imposing positive responses during the first 4 quarters of GDP and income. The income shock is identified through the need to get a positive impulse response for income to the first shock on the first 4 quarters, and the expenditure shock is identified through the positive impulse response to their own shock, to the first shock during the first 4 quarters. Also, the monetary policy is restricted so that it does not react during the first quarter after applying the income and expenditures shocks. The model is stable, in accordance with the characteristic polynomial roots test, all falling within the (0,1) interval.

The impulse responses calculated by using this method are presented below:

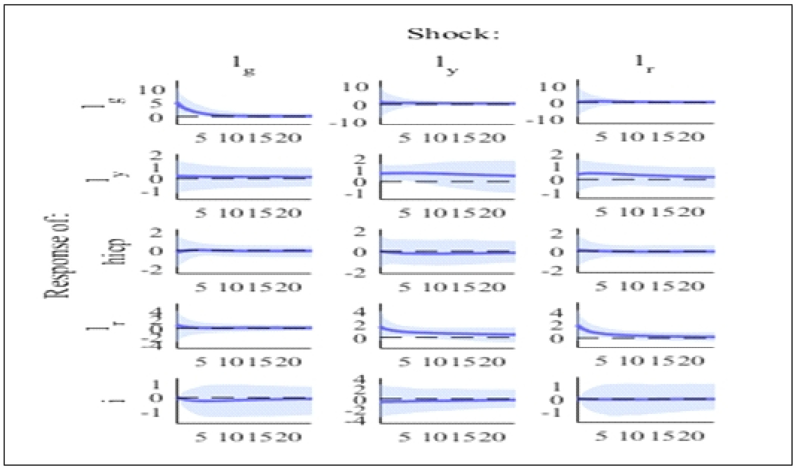

Fig.1.6. IRFs calculated according to Normal Wishart method

We notice (Fig.1.6.) that the restrictions imposed are abided by, so we can retain these results. There are some nuance differences from the previous method, the main ascending or descending trends are followed, but some curves are flatter. The only difference appears in the case of GDP responses to the three shocks, as in all three cases they have slightly higher values from which they begin to decrease after 5 quarters, as opposed to the ones determined through the Minnesota distribution method. Furthermore, by using this method, I also calculated the impact and cumulative fiscal multipliers:

Table 2.5.						
Time (quarter)	1	4	8	12	20	24
Expenditure impact multiplier	0.059	0.150	0.430	0.961	1.467	1.421
Expenditure cumulative multiplier	0.059	0.089	0.125	0.165	0.244	0.274
Income impact multiplier	0.212	0.610	0.934	1.051	1.194	1.132
Income cumulative multiplier	0.212	0.367	0.506	0.590	0.688	0.716

Through this method I obtained greater multipliers (Table 2.5.), but as insignificant from the economic point of view as the others.

5. Conclusion

In this paper I focused on the impact of the fiscal policy on the real economy, namely the effects of the budget balance on the real economy. To that purpose, I chose three macroeconomic variables and two budget elements in order to estimate the impulse responses of the macroeconomic variables following certain shocks from the two main budget categories, net income and expenditures. In order to achieve this, I used five model identification methods: the Choleski decomposition, the Triangular decomposition, the Blanchard and Perotti method (with three exogenously imposed parameters), the sign restriction method and the method using sign restriction and imposing a non-response from the short-term monetary policy, as it is the case in the real economy.

The results I obtained concurred with the theory from the point of view of direction, but, as regards the magnitude of the multipliers calculated for Romania, it is relatively low. That offers proof that this channel of incentivizing the economic activity, represented by the fiscal policy, appears to be extremely weak.

Moreover, in order to achieve a clearer view, I compute the cumulative and impact multipliers for income and expenditures, for each of the above mentioned methods. The low values of multipliers strengthen the idea that the fiscal policy is not efficient in the Romania economy. These results are in accordance with the results of other studies conducted on Central and Eastern European economies (Ilzetzky et al. [2011], Cuaresma et al. [2011], Gonzalez−Garcia et al. [2013]). One possible explanation might be given by the Mundell-Fleming model, which supports the theory that the fiscal policy has low efficiency in small and open economies that have adopted a flexible exchange rate policy, such as Romania.

The current work could be extended by identifying more precise the determinants of fiscal multipliers magnitude and by using bayesian panel modes on Central and Eastern European non-Euro Area countries. That could be done by using different identification methods (such as Mertens and Ravn [2013] or narrative approach by Ramey) or different ways to compute the multipliers (such as the local projection method – as in Jorda [2005]) as well by using an extended sample and adding more countries.

In order to prevent and diminish the negative effects of a potential new economic crisis, the Romanian fiscal policy should have a responsible fiscal policy in the current economic recovery period. That is necessary in order to accumulate again fiscal space – defined as having deficits under the proposed limits –, accumulate sizable buffers for unfavourable moments and to have the public debt level on a descending trajectory, etc.

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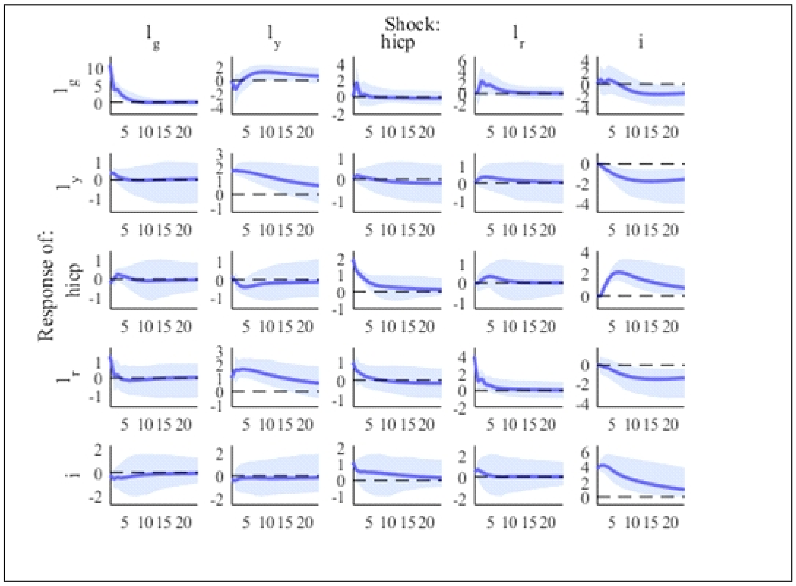
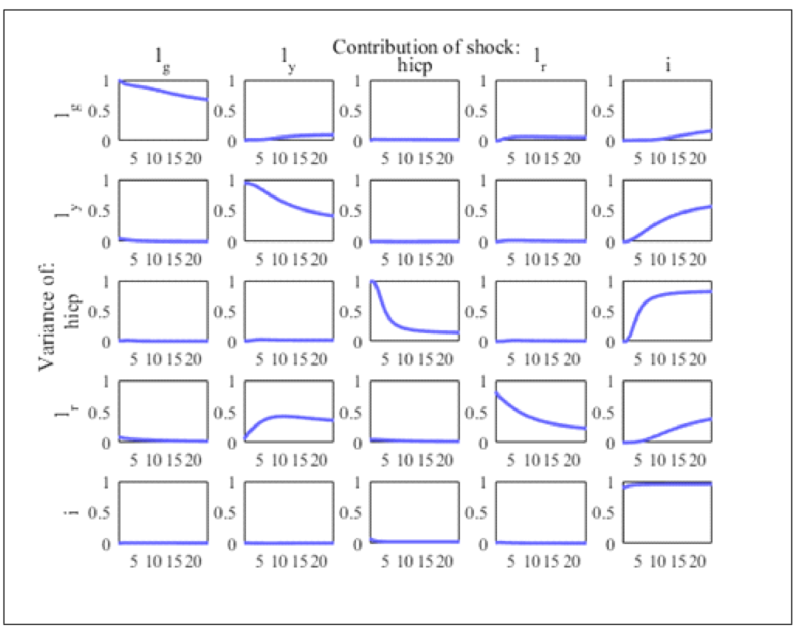
6. Appendixes

6.1. Appendix 1. Model stability – the Choleski decomposition

Roots of the characteristic polynomial (modulus):
0.955 0.621 0.617 0.382 0.325
0.911 0.621 0.524 0.325 0.067
No root lies outside the unit circle.
The estimated VAR model satisfies the stability condition



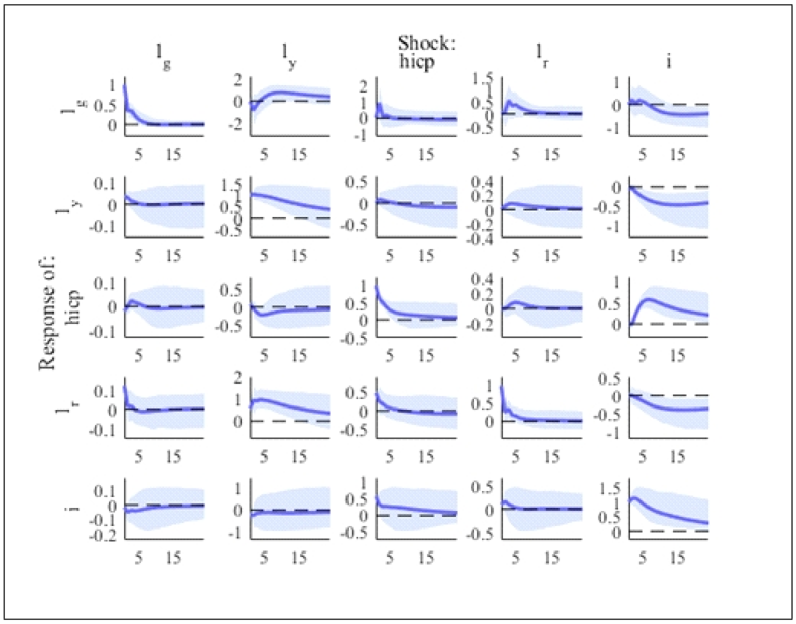
IRF- Choleski decomposition



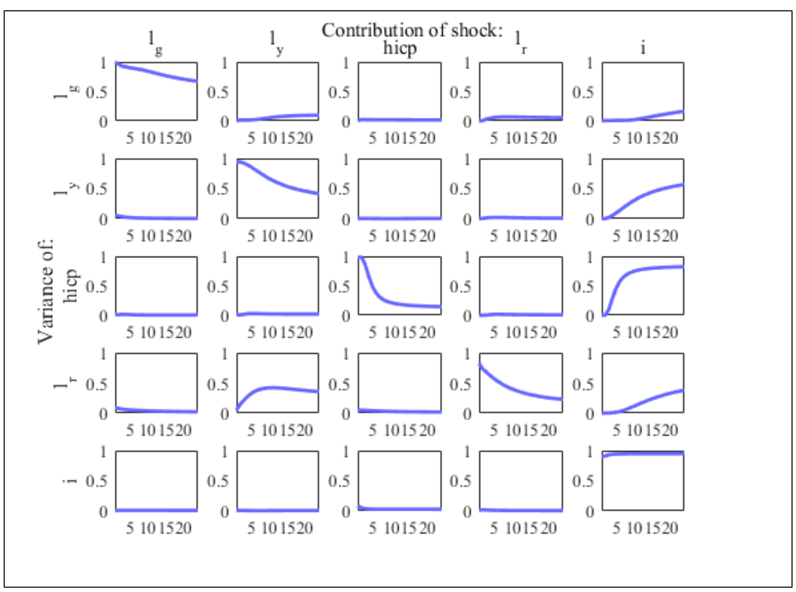
Variance decomposition–Choleski decomposition

Model stability–the Triangular method
Roots of the characteristic polynomial (modulus):
0.955 0.621 0.617 0.382 0.325
0.911 0.621 0.524 0.325 0.067

No root lies outside the unit circle.
The estimated VAR model satisfies the stability condition



IRF - Triangular method



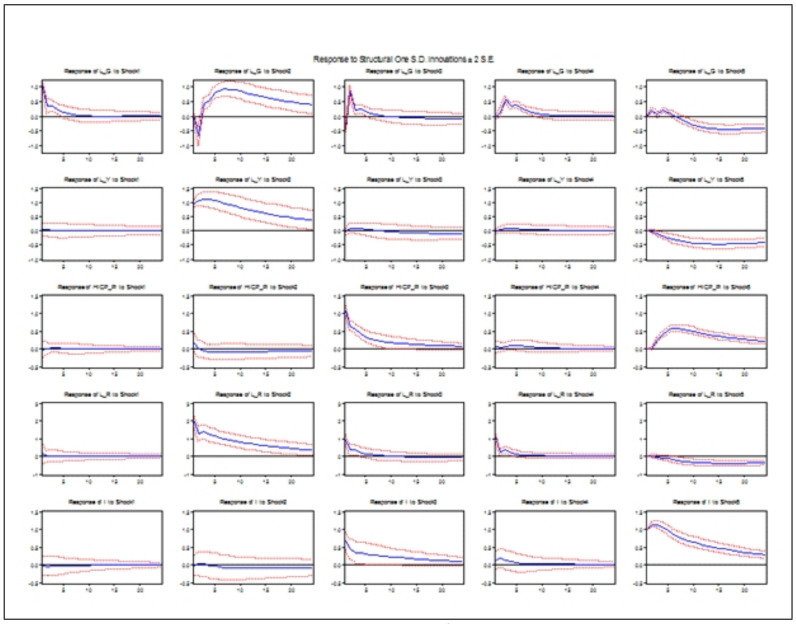
Variance decomposition –Triangular method

Model stability - theBlanchard&Perotti method

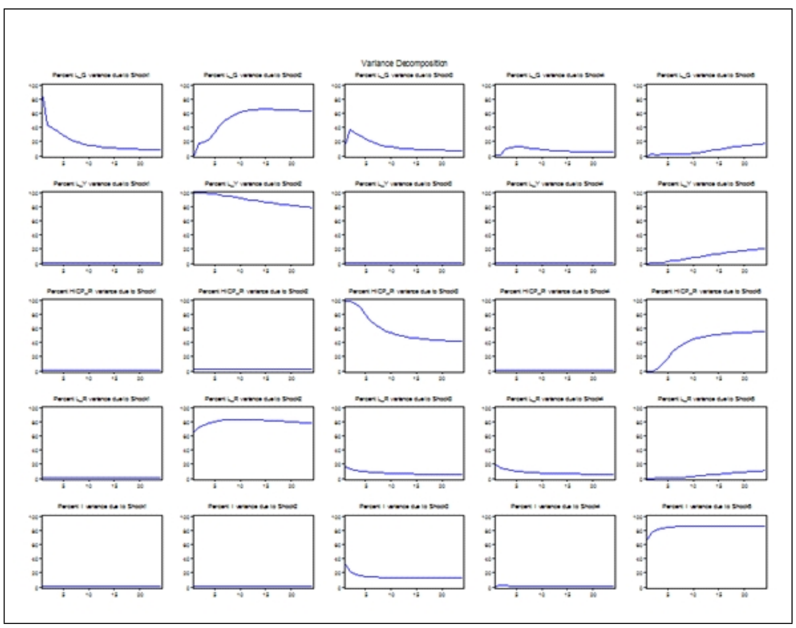
Roots of Characteristic Polynomial
Endogenous variables: L_G L_Y HICP_PI L_R I
Exogenous variables: C
Lag specification: 1 2

Root	Modulus
0.955075	0.955075
0.910939	0.910939
0.586291 - 0.203558i	0.620525
0.586291 + 0.203558i	0.620525
0.617044	0.617044
0.524316	0.524316
-0.382373	0.382373
-0.246634 – 0.211566i	0.324944
-0.246634 + 0.211566i	0.324944
0.067179	0.067179

No root lies outside the unit circle.
VAR satisfies the stability condition.

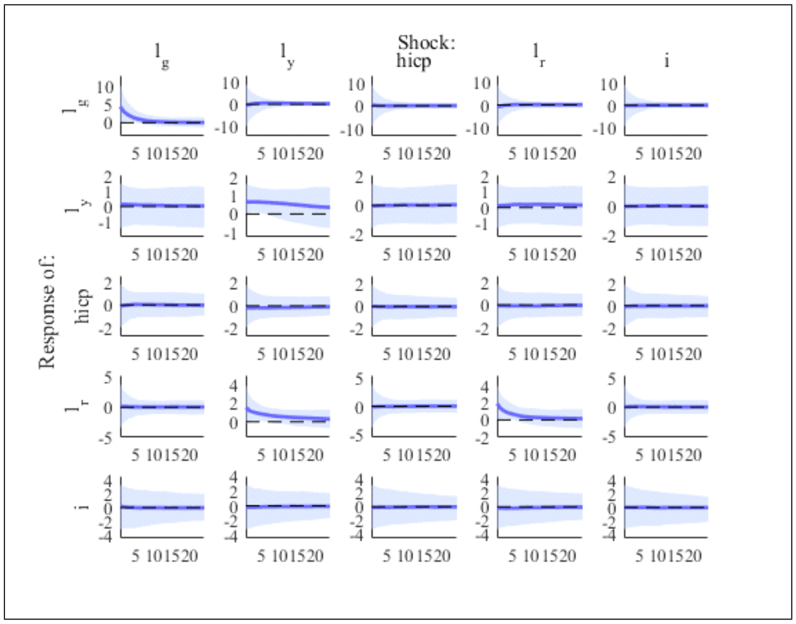


IRF Blanchard&Perotti

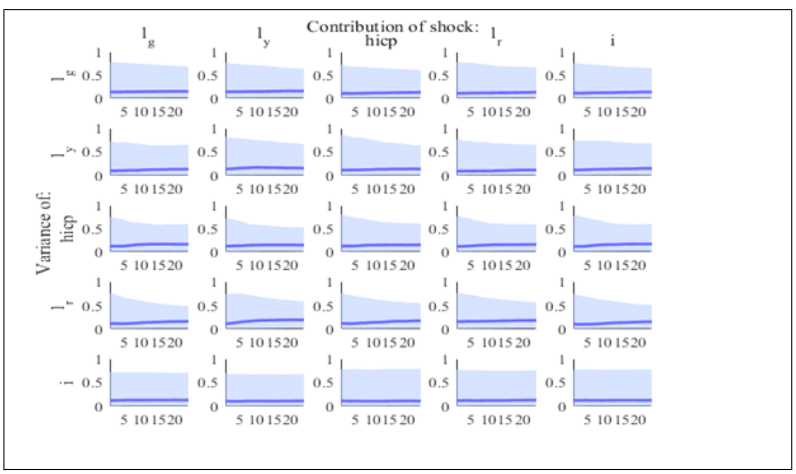


Variance decomposition - Blanchard&Perotti

Model stability – Sign restrictions
Roots of the characteristic polynomial (modulus):
0.956 0.739 0.727 0.046 0.015
0.943 0.727 0.052 0.031 0.015
No root lies outside the unit circle.
The estimated VAR model satisfies the stability condition



IRF – Sign restrictions



Variance decomposition– Sign restrictions

Model stability– Sign restrictions and interest impact rate restrictions (monetary policy)

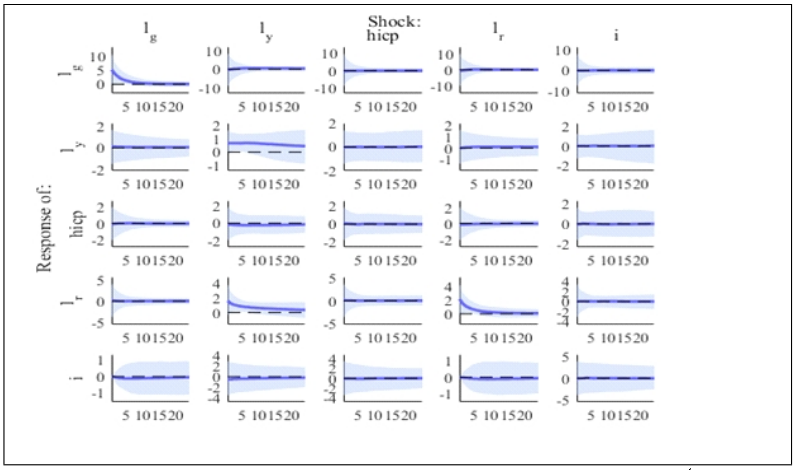
Roots of the characteristic polynomial (modulus):

0.956 0.739 0.727 0.046 0.015

0.943 0.727 0.052 0.031 0.015

No root lies outside the unit circle.

The estimated VAR model satisfies the stability condition



IRF - Sign restrictions and interest impact rate restrictions (monetary policy)

Variance decomposition - Sign restrictions and interest impact rate restrictions (monetary policy)

Stability model - Sign restrictions and interest impact rate restrictions (monetary policy)using the Normal-Wishart distribution

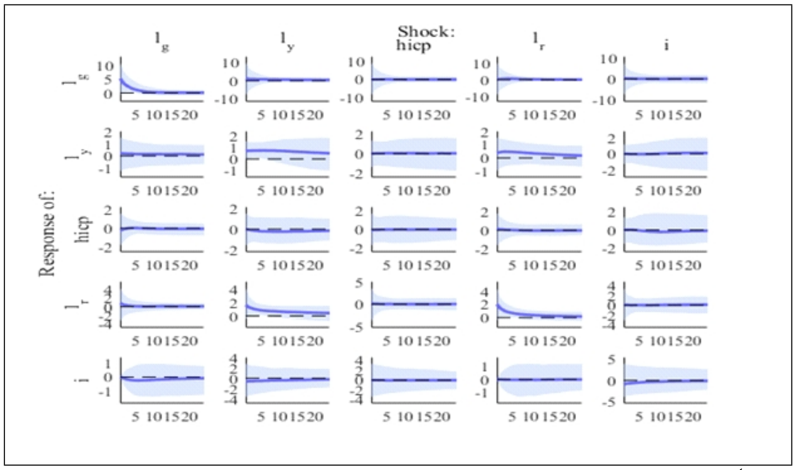
Roots of the characteristic polynomial (modulus):

0.946 0.700 0.666 0.050 0.030

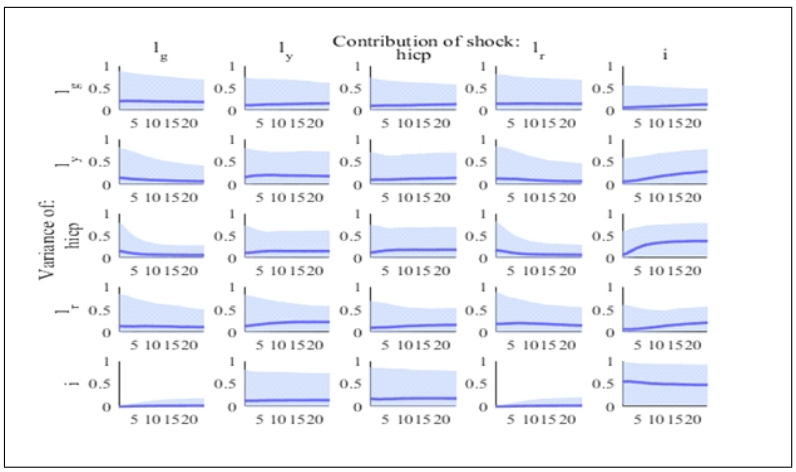
0.946 0.700 0.089 0.050 0.024

No root lies outside the unit circle.

The estimated VAR model satisfies the stability condition



IRF - Sign restrictions and interest impact rate restrictions (monetary policy)using the Normal-Wishart distribution



Variance decomposition - Sign restrictions and interest impact rate restrictions (monetary policy)using the Normal-Wishart distribution