THE MACROECONOMIC EFFECTS OF FISCAL POLICY. A BVAR APPROACH

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Abstract: The interest on fiscal policy has been recently renewed due to the economic recession and given the limited scope of monetary policy to provide additional stimulus for the economy. Also the empirical studies on fiscal policy have not reached a consensus about the effects of fiscal shocks on macroeconomic variables. This study seeks to analyze the effects of government expenditure and tax revenue shocks on economic activity by applying a BVAR methodology. The advantage of the Bayesian technique is that it allows prior information to be imposed on the system, in addition to that provided by data. This paper provides a detailed evaluation of the effects of fiscal policy in Romania, but also for the Eastern European Emerging Markets. Quarterly data for five variables are used in the estimation: GDP, inflation, interest rate, government expenditure and tax revenues. The main results show that the fiscal policy has a small effect on the considered variable.

Keywords: Fiscal Policy, Bayesian estimation, VAR model

JEL Classification: E62, H30

1 INTRODUCTION

The interest for studying fiscal policy shocks has been renewed given the importance of fiscal policy in the economic recovery after the recent economic crisis. Even though the empirical literature on this topic is growing there is still a lack of consensus on either the qualitative or quantitative properties of the effects of fiscal policy shocks on the economic activity. The main focus in the research papers remains especially on the effects of fiscal policy shocks on GDP even if on talk about the fiscal stimulus to counteract the economic downturn or about the

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fiscal consolidation strategies. Different studies provide different results therefore the estimates of the size of the fiscal multipliers are dispersed over a wide range.

An approach commonly used to estimate the effects of fiscal policy shocks on economic activity is based on vector autoregressive (VAR) models. The empirical studies with VAR approach have different scheme of identification of the shocks the main ones being: the recursive approach, the event-study approach, the structural vector autoregressive (SVAR) approach introduced by Blanchard and Perotti (1999) and the sign-restrictions approach introduced by Mountford and Uhlig (2005). Besides these, other related approaches used to investigate the effects of fiscal policy are Bayesian VAR and time varying parameter VAR. The first one relies on Bayesian estimation that allows for prior information to be imposed on the system in addition to the information provided by the data. The second one, compared to the linear model, allows for fiscal policy shocks to vary over time according to the changes in the economic activity. In this study, a Bayesian approach will be considered to assess the effects of fiscal policy shocks on the economic activity.

According to investigation of the existing literature, the number of research papers regarding the impact of fiscal policy for emerging markets is limited compared to the literature for developed economies. The aim of this paper is to contribute to the analysis on the macroeconomic effects of fiscal policy in Eastern European Emerging Economies. A minimal set of endogenous variables (real GDP, inflation, interest rate, government spending and revenues) it is used to analyze empirical evidence from Romania, Bulgaria, Czech Republic and Hungary for the period 2000q1-2013q3. The use of quarterly fiscal data allows identifying more precisely the effects of fiscal policies.

The rest of the paper is structured as follows: the next section provides an overview of the related literature; section 3 briefly presents the methodology used for measuring the effects of fiscal policy and describes the data used in the empirical study, section 4 presents the results while section 5 presents the concluding remarks.

2 Literature Review

In this section I present some recent evidence of the related publications regarding Bayesian estimation of fiscal VAR models.

Afonso and Sousa (2009) investigate the macroeconomic effects of fiscal policy using a Bayesian SVAR approach for the following economies: US, UK,
Germany and Italy. The paper provides a detailed evaluation of the effects of fiscal policy on economic activity: explicitly include the feedback from government debt in estimations, analyze the impact of fiscal policy on the composition of GDP (private investment and private consumption) and investigate how fiscal policy affects stock prices, housing prices and the growth rate of monetary aggregates. The main findings are that government spending shocks have a small effect on GDP, do not impact significantly on private consumption and impact negatively on private investment, have a varied effect on housing prices and a small and positive effect on the growth rate of monetary aggregates. Taking into account the feedback from government debt it is obtained a more persistent effect of fiscal policy on interest rate and GDP.

Michal Franta (2012) analyzes the macroeconomic effects of fiscal policy shocks in the Czech Republic by estimating a small-scale VAR model using Bayesian techniques. The paper provides a complex evaluation in terms of identification schemes of structural shocks of the model by employing, in this regard, three different methods: recursive identification, SVAR formulated in terms of the AB model and sign restrictions. The results obtained suggest that the fiscal policy transmission mechanism in the Czech Republic exhibits some standard features: an increase in output and inflation after a rise in government spending and an increase in government spending after a positive shock to government revenues.

Karagyozova (2013) provides a range of estimates for the fiscal multipliers in Bulgaria using linear VAR models with different identification schemes for fiscal shocks and time varying parameter VAR models. The second method is estimated by Bayesian technique. The main findings are that the effectiveness of fiscal policy in stimulating economic activity is generally low; the spending multipliers do not exceed 0.4 in line with most of the studies on the catching-up EU Member State; the underlying state of the economy appears to be a relevant factor for the nonlinear effects of fiscal policy.

### 3 Methodology and Data

The VAR (p) model can be written as:

\[ y_t = a_0 + \sum_{j=1}^{p} A_j y_{t-j} + \varepsilon_t \]  

(1)
where \( y_t \) for \( t = 1, \ldots, T \), is an \( M \times 1 \) vector containing observations on variables, \( a_0 \) is an \( M \times 1 \) vector of intercepts \( A_j \) is a \( M \times M \) matrix of coefficients and \( \epsilon_t \) is an \( M \times 1 \) vector of errors. It is assumed \( \epsilon_t \) to be i.i.d. \( N(0, \Sigma) \). The VAR model can be rewritten in two alternative formats:

\[
Y = XA + E \quad \quad (2)
\]

\[
y = (I_M \otimes X)\alpha + \epsilon, \quad \epsilon \sim (0, \Sigma \otimes I_T) \quad \quad (3)
\]

where \( Y \) and \( E \) are \( T \times M \) matrices and \( X \) is a \( T \times k \) matrix (\( k \) - number of coefficients in each equation of the VAR), \( I_M \) is the identify matrix and \( \alpha = \text{vec}(A) \) is a \( M \times 1 \) vector. The likelihood function can be derived from (3) and decomposed into the product of a one distribution for \( \alpha \) given \( \Sigma \) and another where \( \Sigma^{-1} \) has a Wishart distribution. Under appropriate conjugate prior restrictions, it can be derived the conditional posterior distribution for the VAR coefficients and the covariance matrix of the reduced form shocks. The prior distributions considered in this paper are uninformative priors. Using additional prior information the VAR coefficients, impulse responses functions and forecasts can be more precisely estimated. The model above is estimated by Bayesian techniques, the fiscal shocks being identified using a recursive scheme (Cholesky decomposition).

The choice of endogenous variables follows the empirical literature, thus the vector of endogenous variables consists of five standard variables commonly used to assess the effects of fiscal policy. The variables are government spending \((g)\), GDP \((y)\), inflation \((\pi)\), government revenues \((t)\), and the interest rate \((r)\), and are used in estimation like listed above. The data are seasonally adjusted with Tramo/Seats. Government spending and revenues and GDP are deflated by GDP deflator. The deflated series are then expressed in log. All the variables are used in first differences. As measurement for inflation it is used GDP deflator and for interest rates the 3-month money market interest rate. The source of data series is Eurostat.

4 Results

The impulse response functions for the government spending shock and revenues shock in Romania are presented in the next two figures. The main interest is to analyze the impact of a government expenditure shock to endogenous variable, especially on real output.
As it is shown in similar studies, the impact of a government spending shock for emergent economies is small. After positive government expenditure shock the real output rise but its intensity is reduced. The fiscal multiplier is very small, less than 1 if it were to compare with fiscal multipliers obtained in empirical studies, for developed economies. After the initial government expenditure the dynamic of the endogenous variables is consistent with the economic theory: inflation, tax revenues and interest rate increase in short-term, but the uncertainty regarding the magnitude of the increase is greater. The response of government spending after a positive shock of government spending is not persistent and the effect of the shock is almost zero from the second quarter.

The endogenous variables respond to a tax revenues shock as in the case of government expenditure shock but with greater intensity. Government spending
increases immediately after the net revenues shock but with a low intensity and persistence. The credible intervals accompanying the response of GDP contain zero, thus the reaction of GDP to the spending shock is not estimated precisely at least for the first period. After a few quarters the GDP responses positively. The inflation response is similarly to the GDP response to a positive revenues shock.

The next figures present the impulse responses to fiscal policy shocks for Bulgaria, Czech Republic and Hungary. As the main interest is to analyze the effect of GDP to fiscal shock, in the following figures is presented only the response of GDP.

![Figure 3 Responses of GDP after the Government Spending Shock](image)

![Figure 4 Responses of GDP after the Government Revenues Shock](image)

The effects of GDP to fiscal policy shocks, as has been identified in this approach are very small. These results are consistent with the main empirical studies on emerging markets. The response of GDP to government fiscal shock in Hungary is positive but the fiscal multiplier is small. For Bulgaria and Czech Republic the results for the impact of a government expenditure shock are inconclusive.

A high uncertainty is associated with the responses of GDP to a government revenues shock in Bulgaria and Hungary. The effect on GDP is rather very weak. For The Czech Republic the same conclusion can be made.

5 CONCLUSIONS

This paper estimates the effect of fiscal policy shocks using Bayesian technique, based on recursive Cholesky approach as the identification scheme of the structural shocks. Bayesian estimation has the advantage of including prior
information regarding distributions of the VAR parameters in order to obtain more precise estimates.

According to the impulse response functions, I can mention the following: the real output shows a weaker response to fiscal shocks, the fiscal multipliers are positive and small meaning the economic activity is not significantly influence by fiscal policy in an emergent country.

Further investigations closely related to this approach, that can improve the results obtained consists in using different type of priors or different identification schemes for the fiscal shock.

REFERENCES