ESTIMATING FISCAL MULTIPLIERS FOR NORTH MACEDONIA: A STRUCTURAL VECTOR ERROR CORRECTION MODEL

Author(s): **Dr. Arbresh Raveni** [a]

[a] Lecturer, Faculty of Social Sciences, "Mother Teresa" University-Skopje,

arbresh.raveni@unt.edu.mk

Abstract

The aim of this research is to evaluate the effectiveness of fiscal policy as a means of influencing output in North Macedonia. We apply a VEC model, and use quarterly data for the period 2000q1-2019q4. Our findings suggest that the possibility of fiscal policy to be used as a short-term stabilization tool was limited by the turbulent early phase of transition and several IMF arrangements; the exchange rate peg; and the scarcity of financial resources. The results of the baseline model suggest that a government spending shock is more effective as a stabilization fiscal tool in Macedonia, compared to a tax shock, although fiscal multipliers smaller than one suggest that the effectiveness of fiscal policy in boosting output is limited. The findings confirm the importance of structural characteristics, suggesing that not accounting for monetary policy reaction and debt dynamics will result in an overstatement of fiscal multipliers. In particular, the results suggest that the "crowding out" effect of fiscal policy due to interest rate pressure is absent and that monetary policy is accommodating an expansionary fiscal policy. The results of our investigation suggest that an increase in government expenditures will induce a significant increase in taxes. Moreover, although an increase in spending/taxes will result in a short-lived increase/decrease in public debt, as a priori expected, we find a long-equilibrium relationship between government spending and taxation suggesting that debt sustainability is not an issue in the case of Macedonia.

Keywords: *fiscal policy, fiscal multipliers, government spending, taxation, North Macedonia.*

Introduction

The objectives of this research are to evaluate whether is there any room/possibility for using fiscal policy as a tool for short-term economic stabilization considering a number of specific features of the Macedonian economy; to provide quantitative estimates for the effect of fiscal shocks on output; and to empirically investigate the effects of the structural characteristics of the country on the transmission channels of fiscal policy.

The fiscal policy overview in North Macedonia suggests a division (paradigm shift) of fiscal policy between two periods: before and after 2008. Fiscal policy in the first period, especially in the first years of transition was focused on consolidating public finances in order to achieve macroeconomic stability, hence, the possibility to be used as a short-term stabilization tool was severely limited. The role of fiscal policy was confined to the work of automatic stabilizers. However, the low level and coverage of unemployment benefits, and the low level of social assistance and its inability to react swiftly to changes in incomes, as well as the predominance of indirect taxes, which are pro-cyclical, are the main factors that make automatic stabilizers largely ineffective (Mojsoska-Blazheski, 2012).

An additional constraint on the usage of fiscal policy for stabilization purposes was the monetary strategy of a fixed exchange rate regime. Considering the fact that North Macedonia is a small open economy, and the insufficient level of foreign exchange reserves in the first years of transition, this would translate into coordinating fiscal policy in order to not disrupt the maintenance of the fixed exchange rate, therefore, additionally limiting any room for using fiscal policy as an output stabilization tool.

For most of the period analyzed North Macedonia was using IMF arrangement in order to stabilize its economy. Therefore, during these years, the macroeconomic policy mix was set up mutually by the North Macedonian government and IMF staff approval, giving priority to the monetary policy objective of maintaining the fixed exchange rate and, consequently, setting small budget deficit

targets or even surpluses, hence limiting the possibility of using fiscal policy as a stabilization tool.

The usage of fiscal policy as a stabilization tool was also constrained by the availability of financial sources, the underdeveloped domestic securities market, and not having access to international capital markets, especially in the first years of transition.

Fiscal policy in North Macedonia experienced a paradigm shift, turning from a prudent use mainly as a subordinate measure of monetary policy objective, to a more proactive use as an output stabilization tool. Several actions in terms of fiscal shocks, albeit small in magnitude, were implemented in 2008 in order to tackle the negative consequences of the global financial crisis in the North Macedonian economy. Additionally, from 2008, a higher budget deficit in the medium term was targeted. The improved macroeconomic stability situation, the improved access to financial sources and improved foreign exchange deposit coverage contributed to increasing the possibility of using fiscal policy as a stabilization tool in the period after 2008.

In this empirical investigation a Vector Error Correction Model (VECM) is used. The VECM is advantageous compared to the Vector Autoregression (VAR), because besides being 'data driven' it also imposes structure in the model reflecting both (i) theoretical judgements and (ii) the cointegration properties of the variables of interest. This feature of our modelling strategy allows us to investigate the long-term fiscal multipliers while considering the government solvency condition. This research contributes to the existing literature of fiscal policy in two aspects. Firstly, considering the lack of thorough studies investigating the short-run dynamics and long-run effects of fiscal policy on output in North Macedonia, this empirical evidence will fill a gap in the empirical literature on Macedonia. Secondly, this investigation will shed more light on the transmission mechanism of fiscal policy in North Macedonia, refer to and compare two main theoretical predictions on fiscal policy, and provide possible recommendations to policymakers in North Macedonia.

The rest of the paper is organized as follows: In the first section a literature overview is provided. The second and third section describes the data and the methodology of investigation. The fourth section unit root and coointegration analysis is provided. The fifth and sixth sections provide the results of the baseline model and the results of robustness checking of the baseline model for different samples and alternative specifications. The final section provides the findings of this research.

Literature Overview The research investigating the effects of fiscal policy in North Macedonia is scarce, mainly due to the short span of data available on fiscal variables on a quarterly basis and its disputable quality. Angelovska-Bezovska et al. (2011) investigate the cyclical behavior of fiscal policy to output gap for the period 19991-2009 by applying a GMM model. Their findings suggest that fiscal policy was procyclical during the period of transition but after 1995 fiscal policy appears to be countercyclical. Stojcevska and Miteski (2016) explore the twin deficit hypothesis in Macedonia for the period 1998-2013 using a VAR model with the following variables: budget balance, GDP, balance of goods and services and exchange rate. Their findings suggest that an expansionary fiscal policy does not aggravate the current account deficit. Petrevski et al. (2016) investigate the interaction of fiscal and monetary policy in Macedonia, Croatia and Bulgaria using a VAR model with the following variables: output inflation, interest rate and budget surplus. Their findings suggest that an expansionary fiscal policy will result in a decrease of interest rates, hence implying that monetary policy is accommodating the fiscal policy shock stabilization role. Their findings also suggest that fiscal policy is procyclical for the period of investigation 1999q1-2011q4. To our best knowledge, so far, there are only two studies investigating the effectiveness of fiscal policy as a stabilisation tool in North Macedonia and computing fiscal multipliers for the corresponding fiscal shocks, Kurtishi (2012) and Trenovski et al. (2016). Kurtishi (2012) investigates the effects of fiscal policy on output and other macroeconomic variables using quarterly data for the period

1997q1-2011q4, and employing a recursive VAR model with the variables ordered as follows: GDP; inflation; average net wage; net imports; the level of credit of the non-government sector; the interest rate; tax revenues; and government expenditure. Kurtishi (2012) suggests that an expansionary fiscal policy in North Macedonia will result in negative fiscal multipliers; i.e. an increase in government spending will result in a positive increase of GDP on impact but afterwards becomes negative. However, it should be emphasized that the IRF plots of fiscal shocks in Kurtishi (2012), on which the computation of the fiscal multipliers is based, show an insignificant response of GDP to both shocks: government spending and tax revenues. The drawback of this study is using relatively many variables (8) in the model with a fairly small number of observations (60), which in turn yields insignificant results. Trenovski et al. (2016) investigate the effects of fiscal policy on output and other macroeconomic variables using quarterly data for the period 2000 q1-2011q4, and employing a recursive VAR model with the variables ordered as follows: government spending; output gap; tax revenue; public debt; inflation; the level of foreign exchange reserves; and interest rate. The Trenovski et al. (2016) findings also suggest fiscal multipliers smaller than one but negative; i.e. an expansionary fiscal policy in North Macedonia will result in a decrease of GDP. However, this study also relies on a short span of data and a relatively big model, hence, small degrees of freedom. To, our best knowledge, there is no study employing a VECM in analyzing the effectiveness of fiscal policy in North Macedonia.

Data Description

The scope of this analysis of the effects of fiscal policy in North Macedonia is limited by data quality and availability on a quarterly basis. The availability of quarterly fiscal series starts from 1997. However, in the early years quarterly budgetary data are fairly problematic in terms of their accuracy, reliability and consistency. Hence, considering the endogeneity bias that may arise if quarterly data are interpolated from annual fiscal data, we refrain from using the whole sample but instead define the sample period from 2000q1-2019q4, considering the quality of the data i.e. that for this period we are assured that the original budgetary data are not interpolated but collected on a monthly basis and are presented in nominal terms and not seasonally adjusted. Although the standard compilation of the fiscal variables in the fiscal policy literature is to use disaggregated data following Blanchard and Perroti (2002), we use total figures of revenues and expenditures in this study due to certain data limitations and methodological inconsistency in the data before 2005. However, for a robustness check, the model will be executed on a different sample period 2005q1-2019q4, with fiscal variables compiled as in Blanchard and Perroti (2002). Fiscal variables are seasonally adjusted by the TRAMO-SEATS method in EViews and deflated by using CPI(2005). The sources of variables used are NBRM and the bulletins of the Ministry of Finance. Considering the short span time series of data available for Macedonia we are constrained to use a parsimonious model with only three variables: GDP, revenues and expenditure. However, in terms of robustness check we augment this baseline model with other macroeconomic variables suggested by the fiscal policy literature.

Methodology

This section provides a brief discussion of the method of investigation used in our empirical analysis and gives arguments for the choice of this methodology. In this empirical investigation a Vector Error Correction Model (VECM) will be used. Similar to vector auto-regression (VAR) models, the VECM is 'data driven', treating the variables in the system as endogenous and exploiting the cointegration properties of the variables of interest. However, VEC models are specified by imposing structure reflecting theoretical judgments. For example, the VECM simultaneously identifies the long-run equilibrium relationships between the levels of the variables, the adjustment mechanisms that maintain or disrupt the long-run relationships, and short-run dynamics, therefore yielding more efficient estimates compared to VAR models. VECM is also advantageous in treating the unit root problem that is apparent in VAR models. Even though VAR models yield consistent

parameter estimates for short-run horizons irrespective of the non-stationarity of variables, Philips (1998) argues that impulse responses for longer time horizons are not consistent in a VAR model with variables containing a unit root. Philips (1998) suggests using a VECM with non-stationary variables if cointegration relationships are present. Additionally, the cointegration properties of the variables can be utilized as identifying restrictions by distinguishing between permanent and transitory shocks.
The reduced form VECM is as follows:

$$\Delta y_t = \alpha\beta' y_{t-1} + \Gamma_1 y_{t-1} + \cdots + \Gamma_{1p-1} y_{t-p+1} + D_t + u_t \qquad \textbf{Eq. (1)}$$

where y_t is a K x 1 vector of time series, α is a K x r matrix of loading coefficients, β is a K x r cointegration matrix,D_t is a vector of deterministic terms, Γ_j is a K x K short run coefficient matrix and $u_t \sim (0,\Sigma\_u)$ is a white noise error term. The relationship between the error term of the structural form VECM, ε_t and reduced form disturbances,u_t, is as follows:

$$u_t = A\varepsilon_t \qquad \text{Eq. (2)}$$

where the contemporaneous impact matrix A needs to be identified in order to compute the responses to structural shocks, εt. If the assumption that structural shocks are uncorrelated and have unit variance holds ($\Sigma_u = I_k$), then:

$$\sum_u = E\,[u_t u_t'] = E[\varepsilon_t \varepsilon_t'] = A\sum_\varepsilon A' = A\,A' \qquad \textit{Eq. (3)}$$

and the symmetry of $\sum_\varepsilon$ and the normalization of structural variances impose K(K+1)/2 restrictions on the K^2 parameters of A; hence, in order to exactly identify elements of A, an additional K(K-1)/2 linear independent restrictions should be imposed. The VECM can be expressed in a vector moving average (VMA) representation as follows:

$$y_t = C(1)\sum_{i=1}^{t}(u_i + \Xi D_i) + C_1(L)(u_t + \Xi D_t) + y_0 \qquad \textit{Eq. (4)}$$

where the total impact matrix

$$C(1) = \beta\perp(\alpha\perp'(I_K - \sum_{i=1}^{p-1}\Gamma_i)\beta\perp)^{-1}\alpha\perp'$$

has a reduced rank rk(C(1))=K-r and α⊥ and β⊥ represent the orthogonal complements of α and β, respectively. From Eq.(4) the long run effects of structural shocks can be written as follows:

$$C(1)A \qquad \text{Eq. (5)}$$

Considering the economic theory on fiscal policy, long-run restrictions can be imposed by setting the elements of Eq.(5) to zero. Hence, following Krusec (2003) and Marattin and Salotti (2013) this empirical analysis will continue as follows:

- Investigate the order of the integration of the variables in the model;
- Determine the cointegration rank and identify cointegration relations using Johansen (1995) ML and Saikkonen and Lutkepohl (2000) methodology;
- Setup a full VEC and subset VEC using cointegration relationships and use the residuals from the full and subset models to form estimates for Σ_u;
- Long-run and contemporaneous restrictions are used to form estimates of A and using the estimated contemporaneous impact matrix structural shocks are recovered;
- Analyse IRFs of the shocks of interest;
- Compute and interpret fiscal multipliers.

Unit Root Testing And Cointegration Analysis

The standard Augmented Dickey Fuller (ADF) test is conducted for all the series augmented by a deterministic term and a constant. The number of lagged differences used on the specification of the testing equation is based firstly on the model diagnostics, and secondly on the information criteria. Additionally, the ADF test with structural break is conducted in a presence of a single structural break (in each case identified by the algorithm included in JMulti). The unit root testing suggests that all of the variables of interest are integrated of order one I(1).
The cointegration properties of the variables in our model are investigated using both the Johansen Trace Test and the Saikkonen and Lütkepohl Test, which allows for cointegration testing in the presence of one or two structural breaks. Testing for cointegration is conducted conditional on the choice of deterministic components and their role in the VECM. Hence, in order to test for cointegration, the underlying VAR model should be specified: i.e. to be determined are both the order of the VAR and the deterministic components to be included in the VAR. Therefore, the following cointegration tests are based on the underlying

fully specified VAR model in I(1) levels:

- Endogenous variables:
  - o the log of GDP (lngdp);
  - o the log of tax revenues (lnt);
  - o and the log of government expenditures (lng)
- 4 lags of endogenous variables
- Deterministic terms:
  - o an intercept and a trend,
  - o impulse, shift and trendshift dummies for both 2005 q1 and 2008 q4

The results suggest 2 cointegration vectors in our model. In order to interpret these cointegration vectors, theoretical considerations should be used for guidance in order to express meaningful long-run relationships (Pesaran and Shin, 2002). These cointegration vectors can be written in terms of Eq. (1) as follows:

$$\begin{bmatrix}\Delta Y_t\\ \Delta T_t\\ \Delta G_t\end{bmatrix}=\begin{bmatrix}a_{11} & a_{12}\\ a_{21} & a_{22}\\ a_{31} & a_{32}\end{bmatrix}\begin{bmatrix}1 & 0 & \beta_1\\ 0 & 1 & \beta_2\end{bmatrix}\begin{bmatrix}Y_{t-1}\\ T_{t-1}\\ G_{t-1}\end{bmatrix}+\sum_{i=1}^{p}\Gamma_i\,\Delta Y_{t-1}+\mathrm{D}_t+\mathrm{u}_t \qquad Eq.\ (6)$$

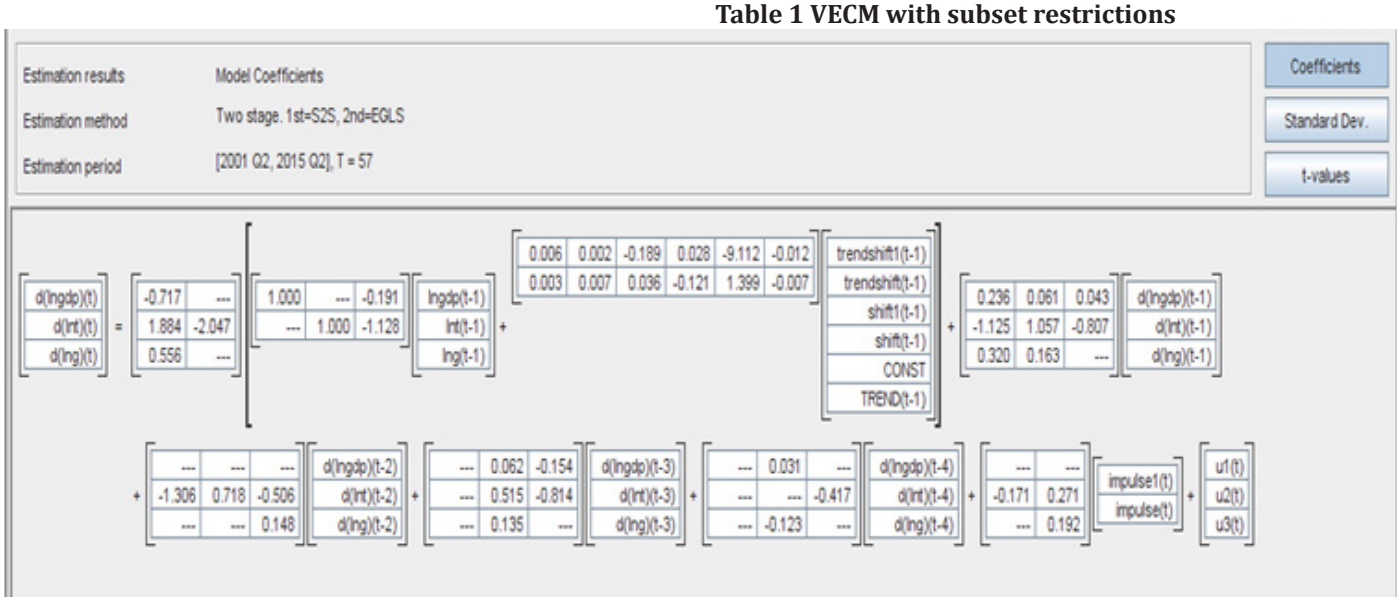
The first cointegration relationship between government expenditure and GDP can be intuitively interpreted in terms of a long-run fiscal multiplier. The second cointegration relationship between government expenditure and tax revenues can be intuitively interpreted in terms of the government solvency condition; i.e., in the long-run, total government expenditures including interest payments on the outstanding debt must equal government revenues in the form of taxes.

Empirical Results

In this section the results of our preferred VECM are provided. A VECM estimated with subset restrictions is reported in Table 1. We note that in this analysis we use a relatively short span of data set from which to extract: the long-run relationship between the log-levels of our two endogenous variables, conditional on a structural break; adjustment paths toward this equilibrium relationship; and short-run relationships between the differenced variables in the VECM. Hence, the number of estimated parameters is reduced using the top-down algorithm that at each iteration omits the variable contributing least to the model. Therefore, the following VECM with subset restrictions is reported in Table 1:

- Endogenous variables ordered as follows:
  - o the log of GDP (lngdp)
  - o the log of tax revenue (lnt)
  - o the log of government expenditure (lng)
- 4 lags of endogenous variables
- 2 cointegration vectors:
  - o The long-term fiscal multiplier: GDP=Bg
  - o The solvency condition: T= Bg
- Deterministic terms constrained to the Cointegration vectors:
  - o shift and trendshift for 2005 Q1
  - o shift 1 and trendshift 1 for 2008 Q4
  - o constant and trend
- Deterministic terms outside of the cointegrating vectors:
  - o -impulse dummies

Table 1 VECM with subset restrictions



Before proceeding with the interpretation of the VECM estimates, in the following part we investigate whether the model is statistically valid and structurally stable. The diagnostic tests are satisfactory. The model is well specified in terms of normality and absence of ARCH effects, although there is some evidence of autocorrelation effects at the sixth lag in the government spending equation. The VEC model is considered to be satisfactory if each adjustment causes the ECM to behave more like a white noise residual: i.e. the cointegrating vector estimated with a constant should fluctuate randomly around mean zero. The plots of the ECM suggest that there is no evidence of significant cross correlation between residuals in the model, and plots of the residuals of the individual equations in the VECM suggest that they are stationary, mean reverting around zero. The plots of Chow stability tests suggest good evidence of structural stability.

In Tables 2 and 3, the α and β' matrices are presented – i.e. the estimated loading coefficients (α) and the estimated cointegration matrix (β) – together with their corresponding statistical significance (shown by t-statistics). The first estimated cointegration relationship captures the co-movement of government expenditure and GDP. The estimate is significant, suggesting that a 1% increase in government expenditure will increase GDP by 0.2% in GDP in the long run.

The second cointegration relationship between government expenditures and tax revenue suggests that, in this case, the government intertemporal budget constraint is binding: i.e. the estimate is significant and suggesting that an increase in government expenditure by 1% must be matched by a long run increase in taxes by 1.128%. The value of the adjustment coefficients is high, statistically significant and stabilizing (i.e. each one has the opposite sign to the respective coefficient in the cointegration vector). For instance, if the level of GDP is too high one period in the past, say by 1%, then the response in the current quarter will be (i) a fall in GDP by 0.717%, (ii) a large rise in tax revenues of 1.884% (which would tend to curtail current GDP), and (iii) a rise in government expenditure by 0.556%. If tax revenues are higher than government expenditure, say by 1%, then in order to restore equilibrium the growth rate of taxes will fall by 2.047%. Aditionally, in the context of the second cointegration vector we test the government solvency condition: lnt=βlng by imposing the corresponding restriction on the beta coefficient, H0:β=1. The Wald test results suggest that the restriction imposed on β holds; i.e. we cannot reject the H0:β=1. Moreover, the remaining coefficients of the VEC model with this restriction on the beta coefficient together with the diagnostic test results are very similar to the model without this restriction.

Table 2 α and β' matrix: coefficient estimates

-0.717	---	1.000	---	-0.191	lngdp(t-1)	0.006	0.002	-0.189	0.028	-9.112	-0.012	trendshift1(t-1)
1.884	-2.047	---	1.000	-1.128	lnt(t-1)	0.003	0.007	0.036	-0.121	1.399	-0.007	trendshift(t-1)
0.556	---				lng(t-1)							shift1(t-1)
												shift(t-1)
												CONST
												TREND(t-1)

Table 3 α and β' matrix: t-values of coefficients

-6.591	---	---	---	-3.346	lngdp(t-1)	3.371	0.678	-3.165	0.589	-15.667	-7.087	trendshift1(t-1)
4.565	-8.975	---	---	-12.663	lnt(t-1)	0.958	1.481	0.382	-1.635	1.539	-2.576	trendshift(t-1)
2.893	---				lng(t-1)							shift1(t-1)
												shift(t-1)
												CONST
												TREND(t-1)

Structural Vector Error Correction Model

In this section, we derive identifying restrictions in order to identify structural shocks. Accordingly, as shown in Table 4, following Krusec (2003) and Marattin and Salotti (2013), we impose the assumption that change in taxes for stabilization purposes does not have a long-term effect on GDP. Also, we restrict the permanent effect of tax changes for stabilization purposes on government expenditure to be zero; i.e. tax changes do not affect government expenditure in the long term. In order to identify structural shocks, additional restrictions must be imposed on the contemporaneous relation matrix. Hence, we assume no contemporaneous effect of tax shocks on government spending, which is an intuitive assumption, because there is unlikely to be a quarterly revision of predetermined spending categories on the basis of unexpected movements in tax collection. We use the decision lag argument to restrict the contemporaneous effect of government expenditure on taxes to zero and also to assume that, within a quarter, there is no contemporaneous effect of GDP on government expenditure. These long-run and contemporaneous restrictions are used to form estimates of the A matrix and, using the estimated contemporaneous impact matrix, structural shocks are recovered. In turn, these assumptions and corresponding restrictions are the platform for computing and analyzing Impulse Response Functions of the shocks to fiscal variables and to compute the corresponding fiscal multipliers.

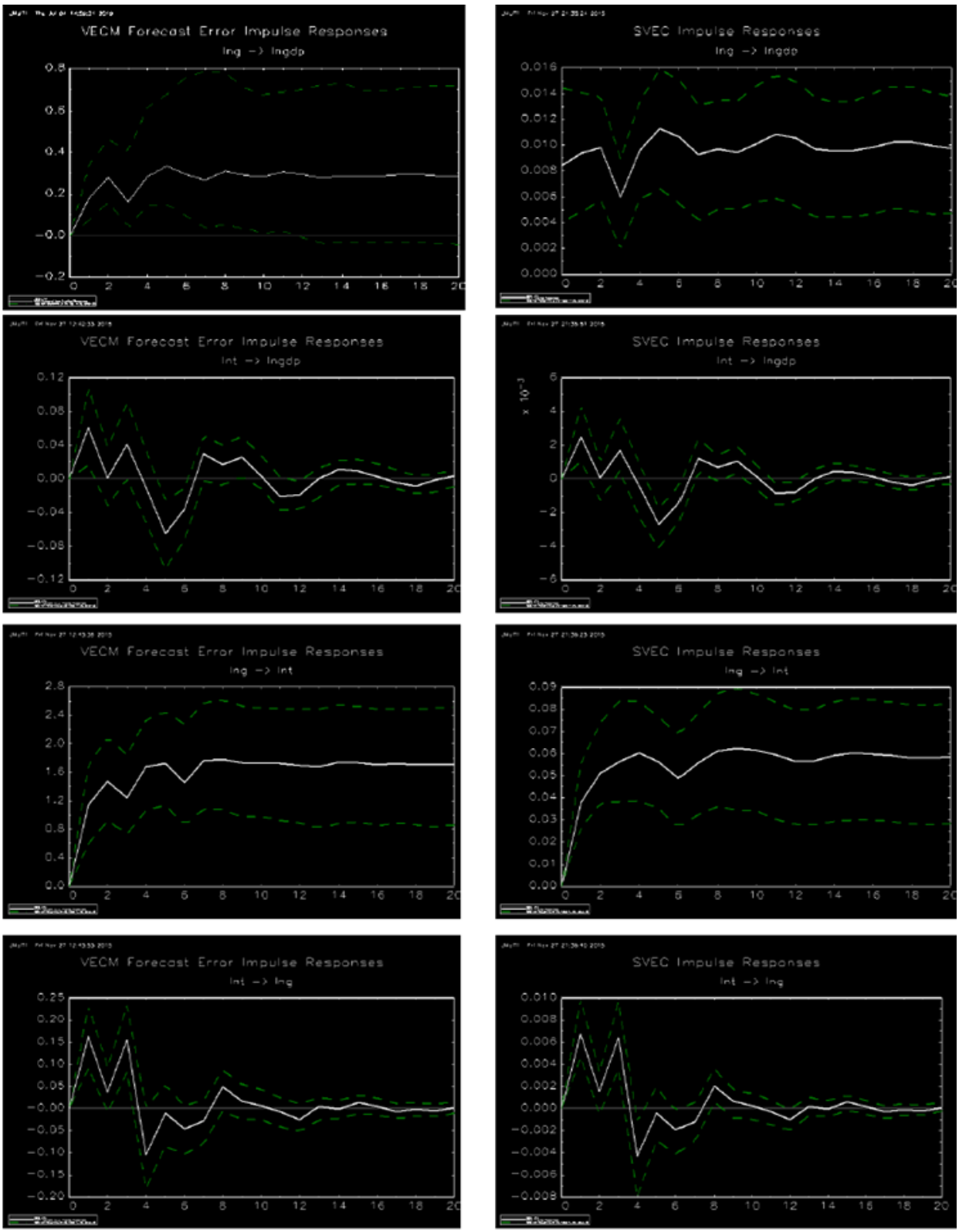
Table 4 Identifying structural shocks: implementation in JMulTi

Impulse Response Function analysis

Figure 1 compares the impulse-responses derived from the estimated reduced form VECM and the Structural VECM . The IRFs of VECM and SVECM are calculated using different units of fiscal shock: a one unit (i.e. one percentage point) shock in the case of IRFs calculated on the platform of the reduced form VECM; and a one standard deviation shock in the case of IRFs calculated from the SVECM. Qualitatively, in Fig.1 the effects can be seen to be very similar with respect to the direction and duration of the responses; however, the responses are measured on different scales and thus cannot be easily compared quantitatively. Considering Lütkepohl's (2005, p.262) suggestion that IR analysis is valid only if the shocks in different variables are independent, we investigate the cross correlation among residuals of the equations in the VECM. In order to make sure that there are not statistically significant cross correlations among the residuals of the equations in the VECM, we compare the off-diagonal elements with the test statistic 2/(square root of T), where T is the number of time-series observations used in estimation. In our case, the test statistic is $2/\sqrt{57}=0.265$ and each of the off-diagonal estimated correlation is smaller than the test statistic (0.265). Hence, in our case, the correlation of residuals is not significantly different from zero and, therefore, we give preference to the IRFs calculated from the VECM and proceed with their quantitative interpretation. The 95% confidence intervals are bootstraped using the Hall (1992) percentile method. The IRFs represent the response of the variable of interest to a one unit shock (i.e. one percentage point) of the fiscal variable. The first two graphs of Fig. 1 correspond to the effect of a government expenditure shock on GDP. The plots indicate that an increase in government expenditure will cause a positive effect on GDP. For instance, a 1% increase in government spending will increase GDP by around 0.3% after a year. The positive effect, albeit small in magnitude, is persistent and significant up to 3 years after the shock. The fifth and sixth graphs in Fig.1 correspond to the effect of a tax revenue shock on GDP. The plots indicate that an increase in taxes, in general, does not significantly affect GDP in Macedonia. The IRF plot shows only a short-lived significant decrease of 0.06% of GDP in the fifth quarter due to 1% increase in taxes. The results are in line with theoretical predictions of the fiscal policy literature and with the findings for other transition countries. However,these results are contrary to the findings of the two previous studies for Macedonia, Kurtishi (2013) and Trenoski (2015), both of which find a positive effect on GDP from a tax increase and a negative effect – albeit not significant – froma government expenditure

shock. The last two graphs of Fig.1 correspond to the effect of a government expenditure shock on taxes and vice versa. Even though these are not our shocks of interest, the plots suggest that an increase in government expenditures will induce a significant increase in taxes, while an increase in taxes will significantly be followed by an increase in government expenditures only in the first year.

Fig.1 Comparison of VECM (left) and SVEC (right) Impulse Response Functions



The IRF plots cannot directly be interpreted as fiscal multipliers, because the fiscal shock and the response of GDP would be expressed in different units: the shock as 1% of spending or tax revenues, and the GDP response as a percentage of GDP. In order to compute fiscal multipliers, additional calculations are done. Specifically, a re-scaling transformation is applied. For instance, the unit shock of government spending is multiplied by the inverse of the average share of spending in GDP in the corresponding sample in order to define the size of the spending shock to be equal to one unit of GDP, hence, to be able to directly interpret impulse responses of GDP as fiscal multipliers. The results presented in Table 5, corresponding to the VECM IRFs, suggest that the output fiscal multiplier from a shock to government spending would be around one. The peak multiplier at the 5thquarter is 0.98, suggesting that an increase in government expenditure equal to 1% of GDP will trigger an increase of 0.98% of GDP. The results suggest that the positive effect of spending shock on GDP, even though small, is persistent, yielding a fiscal multiplier of 0.84 even after 5 years of the initial shock on spending. The results suggest that, ceteris paribus, it is more effectively to use government spending rather than tax shocks, as a stabilization fiscal tool in Macedonia.

Table 5 Output fiscal multipliers from the shock on government expenditure, VECMIR graphs

Quarters	1	2	3	4	5	6	7	8	10	12	16	20
Fiscal multipliers	0.53	0.82	0.48	0.83	0.98	0.86	0.79	0.91	0.83	0.87	0.85	0.84

Source: Authors calculations

Robustness Analysis

For a robustness check, the model will be estimated (i) on a shorter sample period 2005q1-2019q4, and (ii) with fiscal variables compiled as in Blanchard and Perroti (2002). In particular, government expenditure is compiled as the sum of compensation of public employees, intermediate consumption and government gross fixed capital formation. The series on government revenue consists of the sum of direct taxes, indirect taxes, net of social benefits and transfers in kind and subsidies. The results are similar to the baseline model. In the case of North Macedonia, considering the large number of reforms that occurred during this period, in particular several changes of public revenues, which had affected other items besides taxes, for instance contributions, and therefore altered the revenue structure, hence their effect on economic activity, it might be argued in favor of using the total figures of fiscal variables as in the baseline model, in order to better capture the effect of fiscal shocks on the economic activity in Macedonia. As a final robustness check, we use the 2000q1-2019q4 sample period to investigate the effect of monetary policy and debt dynamics on fiscal policy effectiveness in North Macedonia. Considering the North Macedonian economy context, as a small open economy, where monetary policy targets a fixed exchange rate regime, it is important to incorporate in the model the monetary policy reaction while investigating the effects of fiscal policy in Macedonia. A fiscal policy shock may trigger a monetary policy reaction by several transmission channels. For instance, a positive fiscal shock, considering the level of openness of the country may translate into an increase in imports which, in turn, would worsen the current account deficit and put pressure in the fixed exchange rate; hence, the monetary policy would be tightened by increasing interest rates. Consequently, the increase in interest rate would crowd out the initial positive effect of fiscal shock on GDP. Therefore, for a robustness check, we incorporate in the model the interest rate variable (the real interest rate on central bank bills sold at auction), in order to control for the effect of monetary policy in the system. Additionally, as Sims (1988) suggests, the inclusion of financial variables that embody expectations of future changes in fiscal policy, will ameliorate the fiscal foresight problem due

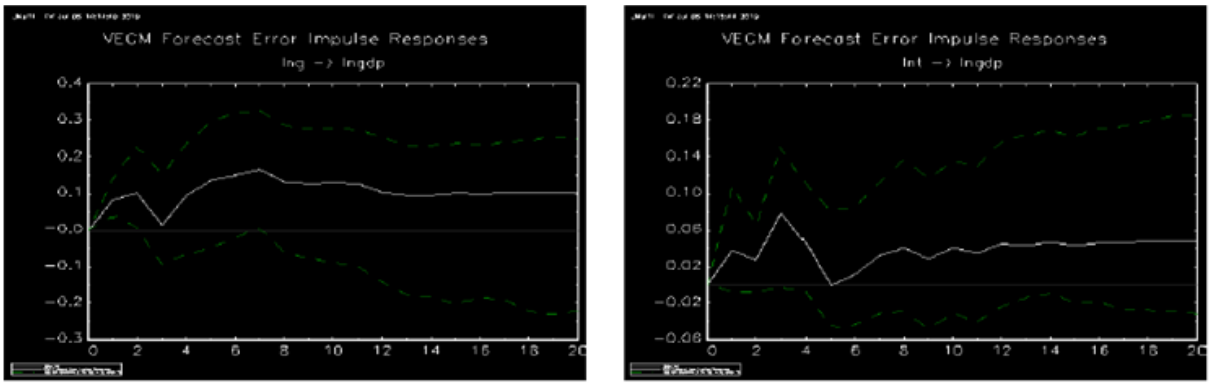
to the decision and implementation lags of fiscal policy. To this end, we augment our parsimonious baseline model with interest rate and public debt variables. The VECM with subset restrictions and the following order of variables is estimated:

- Endogenous variables ordered as follows:
  - o the log of real GDP (lngdp)
  - o the log of real tax revenues (lnt)
  - o the log of real government expenditure (lng)
  - o the real interest rate (real r)
  - o public debt as a % of GDP (debt)
- 4 lags of endogenous variables
- 2 cointegration vectors:
  - o The long-term fiscal multiplier: GDP=Bg
  - o The solvency condition: T= Bg
- Deterministic terms constrained to the cointegration vectors:
  - o shift and trendshift for 2008 Q4
  - o constant and trend
- Deterministic terms outside of the cointegrating vectors:
  - o impulse dummies for 2008 Q4

The diagnostic tests suggest that the model is well specified in terms of serial correlation, although it suffers from non-normality. The plots of the ECM suggest that each of the error correction terms behaves as a white noise residual, and the plots of the stability tests suggest that the model is structurally stable. We give preference to the VECM model compared to the SVEC model, considering that there are no significant cross-correlations among the residuals from the equations of the VECM.

The IRFs of the VECM model presented in Fig.2 suggest that the direction of the response of GDP to a spending shock is similar to the baseline model, although the response is only significant in the first two quarters, possibility due to low degrees of freedom. The first graph in Fig.2 suggests that there is a significant increase in GDP due to an increase in spending, although the fiscal multipliers presented in Table 6 are smaller compared to the baseline model, being 0.52 and 0.27 in the first and second quarters, respectively. Hence, the results suggest that the fiscal multipliers of the baseline model that ignores the influence of monetary policy and debt dynamics are overstated. Similar to the baseline model, the response of output to a tax increase is insignificant. The third and the fourth graph in Fig.2 suggest that fiscal variables do not significantly respond to each other's shocks. The fifth graph suggests that an increase in spending will significantly reduce the real interest rate for the first two years, suggesting that the "crowding out" effect of fiscal policy due to an interest rate pressure is absent and that monetary policy is accommodating an expansionary fiscal policy, in line with the findings of Petrevski et al. (2016). On the other hand, an increase in taxes will result in a significant increase in real interest rates suggesting that austerity measures will be followed by a contractionary monetary policy. The response of the debt/GDP ratio to a spending shock is in line with a priori expectations. An increase in spending will result in a short-lived increase of public debt, whereas an increase in taxes will result in a decrease in public debt, although in both cases the IRFs are only significant in the first two quarters.

Fig.2 Robustness analysis: baseline model +interest rate + debt IRF's of the VECM model



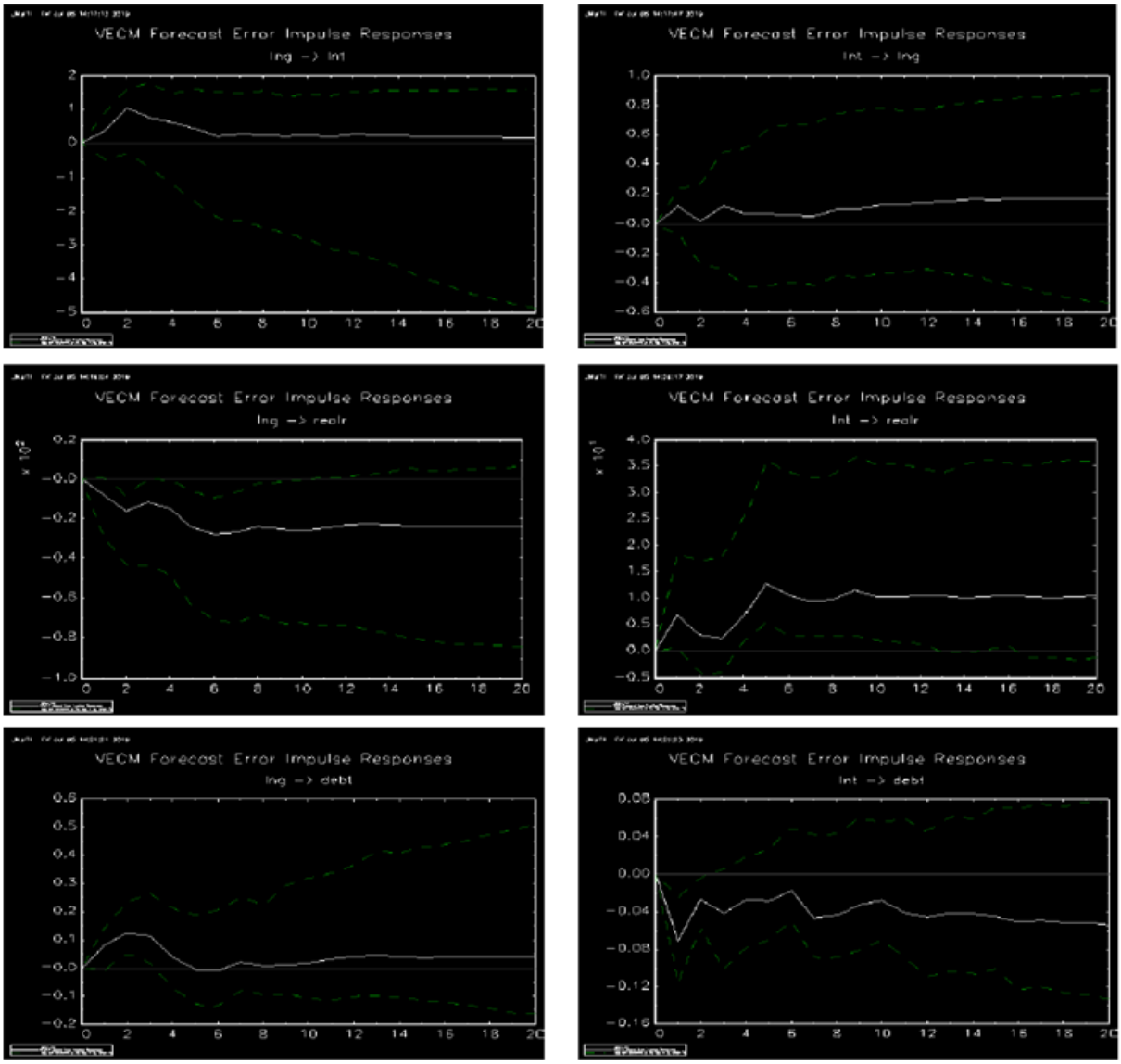


Table 6 Robustness analysis: baseline model +interest rate + debt, sample up to 2018q4, VECM model

Quarters	1	2	3	4	5	6	7	8	10	12	16	20
Fiscal multipliers	0.52	0.27	0.02	0.26	0.14	0.09	0.09	0.15	0.15	0.22	0.17	0.19

Source: Authors calculations

Conclusion

The aim of this chapter is to empirically investigate the effectiveness of fiscal policy on boosting output and effects of fiscal shocks on other macroeconomic variables in North Macedonia. The overview of fiscal policy in Macedonia suggests a "paradigm shift" of fiscal policy after 2008. In the early phase of transition, in order to achieve macroeconomic stability, North Macedonia pursued a prudent fiscal consolidation policy under several supported IMF arrangements. However, after 2008, North Macedonia shifted to an expansionary fiscal policy, which resulted in a doubling of public debt and increasing the risk of debt sustainability.

The possibility of using fiscal policy as a short-term stabilization tool was severely limited due to: a) the turbulent early phase of transition; b) the fixed exchange rate regime and low foreign exchange deposit coverage; c) IMF arrangements aiming at fiscal consolidation; and d) non

availability of financial resources and dependency on external borrowing.

We specified and estimated a VEC model in order to empirically investigate the effectiveness of fiscal policy. The choice of this methodology is based on its feature of exploiting the cointegration properties of the variables and simultaneously identifying the long-run equilibrium relationships between the levels of 1) government spending and GDP (long-run fiscal multipliers) and 2) spending and taxes (government solvency condition), the adjustment mechanisms that maintain or disrupt the long-run relationships, and short-run dynamics, hence, yielding more efficient estimates compared to VAR models.

The results of the baseline model suggest that a government spending shock is more effective as a stabilization fiscal tool in North Macedonia, compared to a tax shock. The response of output to a spending shock is positive, and persistent, yielding a fiscal multiplier of 0.84 even after 5 years of the initial shock on spending. However fiscal multipliers smaller than one suggest that the effectiveness of fiscal policy in boosting output is limited. The results are in line with theoretical predictions from the fiscal policy literature and with findings for other transition countries. However, our findings contradict the findings of the two previous studies for Macedonia that calculate negative fiscal mutipliers, Kurtishi(2013) and Trenoski (2015).

The robustness checks generally confirm the results of the baseline model, suggesting that our findings are stable across different samples and alternative specifications. However, the results suggest that not accounting for monetary policy reaction and debt dynamics will result in an overstatement of fiscal multipliers. Similar to Petrevski et al. (2016), our findings suggest that the "crowding out" effect of fiscal policy due to interest rate pressure is absent and that monetary policy has accommodated expansionary fiscal policy. The results suggest that an increase in spending/taxes will result in a short-lived increase/decrease in public debt, as a priori expected. However, our finding that there is a cointegrating vector between government spending and taxation, indeed an equilibrium relationship in which they moved together in the same proportions, suggests that over the sample period the government solvency condition was satisfied, implying that debt sustainability was not an issue in the case of Macedonia.

References

1. Angelovska-Bezovska, A., Bogoev, J., Mitreska, A. and Kadieska-Vojnovik, M. (2011),' Investigating the cyclical behavior of fiscal policy in the Republic of Macedonia during the period of transition', Croatian Economic Survey, 13(1), 57-104
2. Blanchard, O. and Perotti, R. (2002), 'An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output', Quarterly Journal of Economics 117 (4), 1329–1368.
3. Krusec, D. (2003),' The effects of fiscal policy on output in a Structural VEC model framework: The case of four EMU and four non- EMU OECD countries', European University Institute, November, 2003.
4. Kurtishi, N. (2012), Model for estimation of fiscal policy and its influence on Macedonian economy, Master thesis, Faculty of Economy , Skopje.
5. Lütkepohl, H. (2005),' New Introduction to Multiple Time Series Analysis', Springer, Berlin, DOI: 10.1007/978-3-540-27752-1
6. Marattin, L. and Salotti, S. (2014),' Consumption multipliers of different types of public spending: a structural vector error correction analysis for the UK', Empirical Economics, Springer, 46(4), 1197-1220, June.
7. Mojsoska-Blazevski, N. (2012),' Taxation of labour: the effect of labour taxes and costs on employment in Macedonia', Post-Communist Economies, 24 (2), 241–256.
8. Petrevski, G., Bogoev, J. and Tevdovski, D. (2016),'Fiscal and monetary policy effects in three South Eastern European economies, Empirical Economics, 50(2), 415-441.
9. Phillips, P.C.B. (1998),' Impulse response and forecast error variance asymptotic in nonstationary VARs', Journal of Econometrics, 83, 21–56.
10. Pesaran, M. and Shin, J. (2002),' Long-run structural modelling', Econometric Reviews, 21(1), 49-87.
11. Sims, A. (1988), 'Identifying Policy Effects', Empirical Macroeconomics for Interdependent Economics, ed. by R. C. Bryant, pp. 308–321. The Brookings, Washington, DC.
12. Stojcevska, V, and Miteski, M. (2016), 'Assesment of the impact of fiscal policy on the current account-the twin deficit hypothesis in the case of Macedonian economy', NBRM Working Paper, Nr.2016-01
13. Trenovski, B., Filipovski, V. and Fiti, T. (2016),' Efficiency of the fiscal policy and the fiscal multipliers-the case of the Republic of Macedonia', Ikonomicheski Izsledvania, vol.1.