
MODELING DYNAMIC EFFECTS OF CHANGES IN PUBLIC SPENDING AND TAXES ON ECONOMIC ACTIVITY IN REPUBLIC OF NORTH MACEDONIA

Mahije Mustafi

“Pjetër Budi” College, Business Administration Department, Prishtina, Kosovo,
mahijemustafi@hotmail.com

Abstract: The aim of this paper is to estimate the impact of fiscal policy, primarily through public spending over the economic activity of the country. The topic is to specially present both the domestic and the international public, not only in the academia, but also between the holders of economic policies.

Keynesian and neoclassical economic school have different views on the impact of public spending over the economic activity. The paper is a detailed overview of the huge number of relevant scientific researches that empirically document these effects. The special attention is paid to modeling using vector autoregressive models.

In this paper thesis by means of vector autoregressive model determines the impact of public spending over economic activity in the Republic of North Macedonia. The reason for the use of this model is set for GDP (gross domestic product) and public spending are unsteady.

The function of the impulse-response suggests that economic activity has a positive response to the shock of public spending in a period of four quarters, and after six quarters the response of economic activity becomes negative which is in accordance with Keynesian models and neoclassical models of business cycles.

After 6 quarters the response of GDP (gross domestic product) becomes negative, and the reason for this may be the period of recession which occurs in the second half of the period of observation, as well as the quality of public expenditure. The analysis is done in EViews and JMulTi programs.

Keywords: fiscal policy, economic activity, EViews, gross domestic product.

1. INTRODUCTION

The role of fiscal policy in influencing economic activity is among the issues with the most extensive discussions among academics and policymakers. For the role of fiscal policy, contemporary literature can be divided into two general ideological schools. Neoclassical literature argues that expansionary fiscal policy reduces the output of the private sector through the spread, and therefore inflation. The increase in public debt leads to an increase in interest rates, thereby reducing the output and inflation. Moreover, the increase in public debt leads to an increase in public expectations of taxes in the future, which in turn will increase the secured labor force and will subsequently reduce real wages and consumption, in parallel with current activity and inflation. On the other hand, the New Keynesian School argues that rising public spending increases demand and thus increases economic activity, i.e. output. This is the so-called "collecting" or "multiplier" effect. Blanchard and Perotti (2002) suggest that the structural VAR approach seems more convenient for studying fiscal policy than for monetary policy. They say there are many factors that contribute to the movement of budget variables, that is to say, there are many exogenous fiscal shocks (in relation to the output). Numerous studies find that the recurrence of fiscal policy differs between new countries and high-income countries. Numerous empirical researchers have found that fiscal policy in developing countries pretends to become pro-cyclical, in contrast to high-income countries where fiscal policy is increasingly counter-cyclical. The IMF suggests that fiscal policy tends to become less counter-cyclical in emerging fixed-exchange markets. Hemming and others (2002) concluded that the appropriate fiscal stance during the crisis would depend on a number of factors, as well as from the very approach of countries and, of course, from the episode's episode after an episode, which can reveal whether fiscal expansion or contraction is appropriate. In order to achieve recognition, we rely on institutional information about tax and transfer systems, as well as the timing of tax collection, in order to create an automatic response to fiscal policy for economic activity, with an implication to recognize the fiscal policy shocks. Changes in taxes or public spending (the so-called "fiscal shock") at any time impede their development. This simple fact is overlooked in analyzing the effects of fiscal policy, based on vector-based autoregressive models. Fiscal expansions designed to stimulate the economy may have different effects on different sectors of the economy. Also, the effect of overall expansion activity may be positive, but different sectors may develop in a variety of ways that will mean that some parts of the population will be worse. The probability of this is greater for increased public spending than for tax reductions. The reason for this is that the change in government purchases is more likely to be concentrated in certain specific sectors of the economy. The candidacy of Macedonia has implications for EU membership in terms of the budget. EU funds will be available, but the government should manage and use those funds. Once it becomes a member of the EU, the country will have to contribute to the EU budget. The use of EU

funds is one of the most important tasks that Macedonia will face. The Republic of Macedonia, like the other new EU member states, has to make changes in public expenditures and in the tax system. The Republic of Macedonia is continuously under the multilateral fiscal supervision of the European Commission by submitting fiscal notifications and pre-accession economic program. Since 2005, with the acquisition of candidate country status, the Republic of Macedonia has been obliged to prepare and submit to the European Commission a medium-term pre-accession economic program on a regular annual basis, which is the preparation of candidate countries for the further coordination of economic policies as future countries members of the EU. Through this program, the Republic of Macedonia is preparing for gradual integration into multilateral fiscal supervision in the context of the economic and monetary union and strategy - Europe in 2020. The Republic of Macedonia should keep in mind that the euro zone countries, which were focused on large fiscal consolidation, generally managed to achieve the projected reduction of the budget deficit. Thus, in the fast-growing economies, in 2010, fiscal policy was countercyclical. For example: in some economies, revenue collection has exceeded expectations, mainly reflecting stronger growth and higher goods prices, and in some cases of voluminous one-off revenues (in particular, the sale of oil concessions in Brazil and the auction of telecommunication licenses in India). These higher incomes were generally used to finance higher budget spending, which in some countries (especially Brazil, China and India) led to a higher fiscal imbalance than projected. Some countries are expected to realize lower overall and cyclically-adjusted deficits than previously projected, due to the impact of higher goods prices (Russia, Saudi Arabia) and delays in the implementation of capital projects (Turkey).

2. METHODOLOGY OF THE RESEARCH

Vector autoregressive models (marked with VAR, which comes from the English term Vector Auto-Regression). VAR models allow modeling to be based on the evolution of fundamental factors, primarily financial and macroeconomic. Thus, a VAR model represents a system of regression models, i.e. contains more than one dependent variable.

3. VECTOR AUTOREGRESSIVE MODELS

Public consumption and taxation affect GDP (gross domestic product) because it is assumed that both are dependent on one another. In order to assess the effects of one variable, it is also necessary to include other variables. We will focus on two variables budget defects, which consist of the costs and the revenue variable.

The cost variable defines the total purchases of goods and services, in government consumption plus government investments. It is called "public spending" or simply "spending in a short time frame". The income variable is defined as total tax revenue minus transfers (including interest rates). This is called "net taxes" or "taxes" for a short period of time.

- (1) The basic VAR specification is (Blanchard, & Perotti, 2002)
- (2) $Y_t = A(L, q)Y_{t-1} + U_t$,
where $Y_t = (T_t, G_t, X_t)$ is a three-dimensional vector of logarithm values, logarithms of public revenue, public expenditure and GDP per capital.
- (3) The model uses quarterly data $U_t = (t_t, g_t, x_t)$ is an appropriate reduced-form vector of residues that will generally have zero cross-correlations. For illustrative purposes, the tax is paid in the last quarter of each year for activity during the year, depend on GDP in the current and past three quarters, while in the other three quarters will be equal to zero and will not depend on GDP (gross domestic product)

The equations can be written in the following form:

- (2) $t_t = a_1 + x_t + a_2 e_t^g + e_t^t$
- (3) $g_t = b_1 x_t + b_2 e_t^t + e_t^g$
- (4) $x_t = c_1 t_t + c_2 g_t + e_t^x$,

where e_t^t , e_t^g , and e_t^x interconnected structural shocks. The first equation states that unexpected tax movements may be due to one of the three factors: the response to unplanned movements in GDP represented by a_1 , x_t , the response to structural shocks in consumption, represented by a_2 , e_t^g , and structural shocks of taxes represented by e_t^t .

The model has a similar performance in the unexpected spending trends in the second equation. The third equation states that unexpected production movements can be due to unexpected tax movements, unexpected spending movements, or other unexpected shocks

- (1) The methodology for identifying this system can be divided into several steps. (Blanchard, & Perotti, 2002, Journal of Economics, p.117)

1. Tax information, transmission and costing programs to build parameters a_1 and b_1 . These coefficients could affect two different effects of tax and spending activity: the automatic effects of economic activity on taxes and spending under existing fiscal policy rules, as well as all discretionary adjustments made to fiscal policy in response to

unexpected events within every quarter. The key to our identification procedure is to prove that the use of quarterly data virtually eliminates the second channel.

This evidence on the implementation of fiscal policy shows that a policy maker and legislation is needed, so that they can learn more details about the shock of GDP (gross domestic product), to decide which fiscal measures, if there are some, will be used, to take responsibility, and then these measures must pass through the legislature and finally to be implemented. To a certain extent, fiscal policy can be taken as a response to unexpected changes in GDP throughout the year. Identification is achieved by assuming that the variables of the private sector do not respond to policy variables at the same time. On the contrary, it is assumed that economic activity does not affect policy, except for automatic feedback embedded in the tax code and in the transfer system.

To create \mathbf{a}_1 and \mathbf{b}_1 , only elasticity in the production of government purchases and taxes minus transfers should be created. In order to obtain these elasticities, information about the cost characteristics and tax transfer systems should be used. Because we cannot identify the possible automated feedback from economic activity in government procurement of goods and services, we say that $\mathbf{b}_1 = \mathbf{0}$.

By converting net taxes, the level of net taxes is written down, such as: $\check{\mathbf{T}} = \Sigma \check{\mathbf{T}}_i$, where $\check{\mathbf{T}}_i$ are positive if they correspond to taxes, and negative if they correspond with the transfers.

\mathbf{B}_1 is the tax base corresponding to the tax $\check{\mathbf{T}}_1$ (or in the case of transfers, an appropriate total amount for the transfer program, that is to say, the unemployment benefits for the unemployed).

Hence, it can be summarized in relation to the quarterly elasticity of net taxes from the aspect of production, \mathbf{a}_1 ,

$$(5) \mathbf{a}_1 = \sum_i \eta_{\mathbf{T}_i \mathbf{B}_i} \eta_{\mathbf{B}_i} \mathbf{x} \frac{\check{\mathbf{T}}_i}{\check{\mathbf{T}}}$$

where $\eta_{\mathbf{T}_i \mathbf{B}_i}$ indicates the elasticity of taxes of the type i for their tax base where $\eta_{\mathbf{B}_i}$,

\mathbf{x} indicates the elasticity of the tax base of GDP (gross domestic product).

To create these elasticity, Giorno and others (1995) created $\eta_{\mathbf{T}_i \mathbf{B}_i}$ and $\eta_{\mathbf{B}_i}$, \mathbf{x} for four separate categories of taxes. These elasticities are calculated in relation to annual changes, and this is done in relation to quarterly changes.

(1) With estimates of \mathbf{a}_1 and \mathbf{b}_1 , it is created cyclically adjusted and with reduced tax form and residual consumption $\check{\mathbf{t}}_t \equiv \mathbf{t}_t - \mathbf{a}_1 \mathbf{x}_t$ and $\check{\mathbf{g}}_t \equiv \mathbf{g}_t - \mathbf{b}_1 \mathbf{x}_t = \mathbf{g}_t$ (such as $\mathbf{b}_1 = \mathbf{0}$).

It is obvious that $\check{\mathbf{t}}_t$ and $\check{\mathbf{g}}_t$ can still be in correlation, but not in correlation with \mathbf{e}_t^x , so they can be used as instruments to estimate \mathbf{c}_1 and \mathbf{c}_2 in the regression of \mathbf{x}_t for \mathbf{t}_t and \mathbf{g}_t .

Two coefficients are given to estimate \mathbf{a}_2 and \mathbf{b}_2 . There is no convincing way to identify these coefficients of correlation between $\check{\mathbf{t}}_t$ and $\check{\mathbf{g}}_t$. When the government raises taxes and spending at the same time, it is asked if taxes correspond to the increase in costs (i.e., $\mathbf{a}_2 \neq \mathbf{0}$, $\mathbf{b}_2 = \mathbf{0}$) or vice versa? In this way, we present the results of two alternative assumptions. According to the first, we assume that the tax solutions come first, so $\mathbf{a}_2 = \mathbf{0}$ whereby we can estimate \mathbf{b}_2 . According to the second, we assume that the spending decisions come in the first place, so that $\mathbf{b}_2 = \mathbf{0}$, whereby \mathbf{a}_2 can be estimated. If the correlation between $\check{\mathbf{t}}_t$ and $\check{\mathbf{g}}_t$ is small enough, the order leads to a small difference in the impulse in terms of the production.

Controlling inflation can be particularly important since all variables are expressed in real terms, but the cost of goods and services is typically budgeted under normal conditions and the personal tax group is not indexed at the same time. For these reasons, inflation shocks are likely to affect the costs of the tax.

4. IMPULSE RESPONSE FUNCTIONS

With tax identification and cost shocks, can be studied their effects on GDP. But, there are two problems. The first is that the built-in elasticity of net production taxes, \mathbf{a}_1 , varies over time, so that we calculate the impulse response using the mean value of \mathbf{a}_1 . The second problem relates to the results of the quarterly dependence, where the effects of fiscal policy differ depending on the quarterly fiscal shock. To avoid estimating the four different impulse responses, calculate the covariance matrix of dependent VAR matrix, and then use the VAR estimate without quarterly dependence (except for the average value) to characterize the dynamic effects of the shocks. Thus, the impulse responses undoubtedly give an imprecise and average dynamic response to fiscal shocks.

5. EMPIRICAL ANALYSIS

The aim of the empirical analysis is to determine the impact of public spending on the economic activity in the Republic of Macedonia. The economic activity is represented through the gross domestic product (GDP), seasonally adjusted (using the CENSUS X-12 method) and in real terms (2005 = 100, in millions of denars). Public consumption is presented as consumption of the Central Government of Macedonia, seasonally adjusted (using the CENSUS X-12 method) and in real amounts (in millions of denars). The nominal amounts of the two variables were downloaded from the website of the Ministry of Finance of the Republic of Macedonia, and the transformations of

the data were made in the econometric program E-Views. Quarterly data are used, and for the monitoring period the period from the first quarter of 2002 to the fourth quarter of 2011 is taken. Chart 1 shows the movement of the real GDP of Macedonia in the observation period (denoted by the variable bdp), while Chart 2 shows the movement of the changes in the real public consumption in Macedonia (indicated by expenditures).

Chart1: Movement of GDP seasonally adjusted
BDP

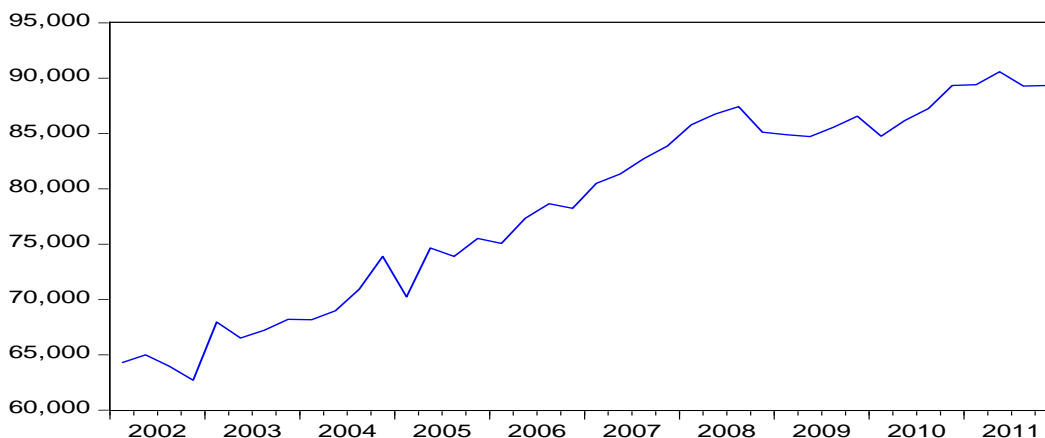
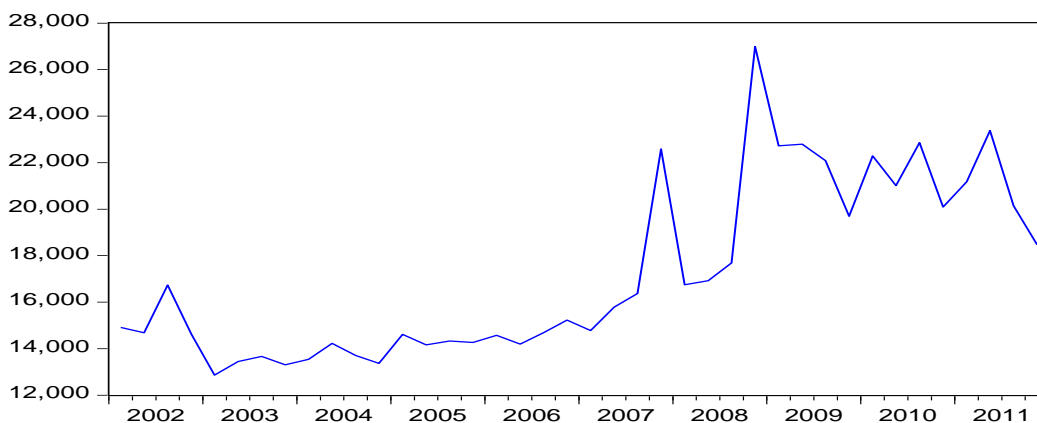


Chart 2: Movement of the nominal consumption of the Central Government seasonally adjusted.
RASHODI



The chart shows the testing of the stationary of the two variables using a single root test. Three specifications of this test are used: with a cut-off, with a trend and a cut-off and without anything. The table shows the t-values of each test specification, and the brackets give the corresponding p-values. All t-values and p-values show that the two variables have a single root, i.e. are non-stationary, at a level of significance of 0.01.

Table1: Stationary testing

Variable	Cut-off	Trend and cut-off	Nothing
GDP	-1.011558 (0.7394)	-1.371702 (0.8533)	3.194987 (0.9994)
Expenditures	-2.145794 (0.2287)	-3.838830 (0.0249)	0.082557 (0.7030)

Due to the non-stationary of the variables, the analysis uses one specification of vector auto-regression models called the error correction model. The error correction model is a dynamic model for the first differentials of I (1) variables used in co-integrated regression. The name itself "error correction" comes from the model which is structured to provide correction of short-term deviations from long-term balance. The mathematical expression of the model is as follows:

$$\Delta x_t = c_1 + \sum_{i=1}^{m_1} \phi_{1i} \Delta x_{t-i} + \sum_{i=1}^{m_2} \phi_{2i} \Delta y_{t-i} + \gamma_1 z_{t-1} + u_{1t}$$

$$\Delta y_t = c_2 + \sum_{i=1}^{m_3} \phi_{3i} \Delta x_{t-i} + \sum_{i=1}^{m_4} \phi_{4i} \Delta y_{t-i} + \gamma_2 z_{t-1} + u_{2t}$$

where Δ denotes the first-order differential operator, $z = x - cy$ is the error corrector, x indicates BDP, and y indicates the expense.

Chart 3: Response of GDP to shock in the public consumer

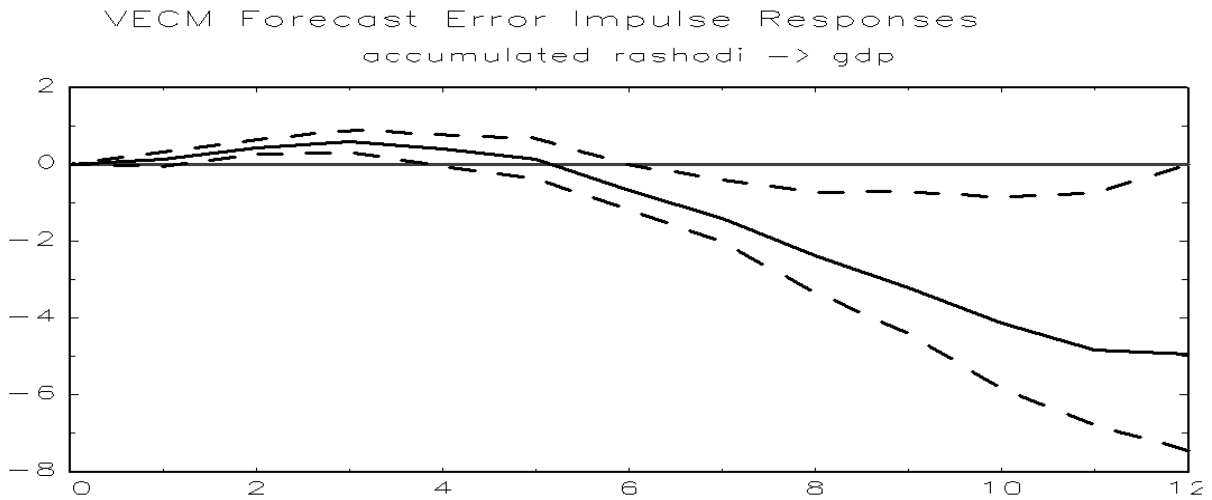
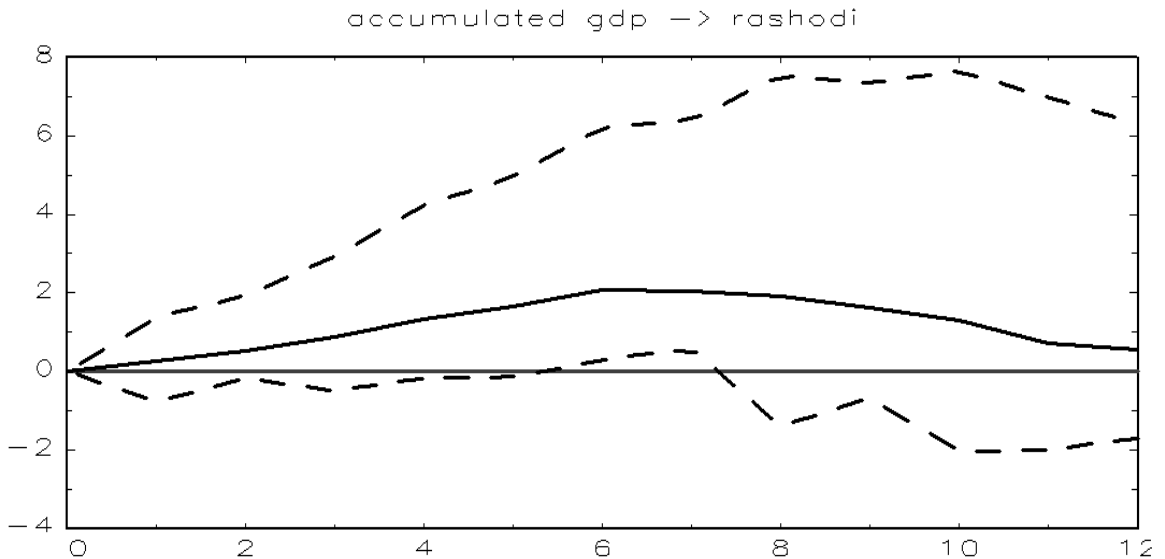


Chart 4: Response to public consumption of shock in GDP



Information criteria indicate that the optimal number of endogenous lags in the model is 10. Additionally, there is 1 co integrating rank. The evaluation of the model is done in the JMulTi statistical program. Chart 3 shows the function of impulse - response to the impact of public spending on GDP. The interrupted lines give 95% confidence intervals of Hall. The positive response to GDP over a period of four-quarters of shock to the public spending is in accordance with Keynesian models and neoclassical business cycle models. Moreover, after 6 quarters, the GDP response becomes negative, and the reason for this may be the recession period that occurs in the second half of the monitoring period, as well as the quality of public expenditures. The Impulse Function - Response to the Impact of

GDP on Public Consumption is shown in Chart 4. With interrupted lines, 95% confidence intervals of Hall are given. The function shows that there is persistence in the answer, although the results are mainly statistically insignificant.

6. CONCLUSION

Our main goal in this article was to analyze carefully as much as possible the impact of fiscal policy, primarily through public spending, on the economic activity in the transition period of the Republic of Macedonia. Impulse-response function shows that economic activity has a positive response to public spending shock over a period of four quarters, and after six quarters, the response to economic activity becomes negative and it is in accordance with Keynesian models and neoclassical business cycle models. Besides, after six quarters, the GDP response becomes negative, and the reason for this may be the recession period that occurs in the second half of the monitoring period, but also the quality of public expenditures. The restriction of the analysis is the relatively small number of observations of the observed variables. But this is an imminent characteristic that every macroeconomic analysis of transition countries faces.

REFERENCES

- Beetsma, R., (2008): “A survey of the effects of discretionary fiscal policy”, *Studier i Finanspolitik* No.2008/2.
- Blanchard, O.J., and R. Perotti (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. November.
- Blanchard, O.J., and R. Perotti (2002). An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output. *Quarterly Journal of Economics* 117(4):
- Halkos G.E. and Paizanos E. (2015). Environmental Macroeconomics: A critical literature review and future empirical research directions, MPRA working paper, No. 67432.
- Hemming, Richard, Michael Kell and Selma Mahfouz,(2002), “The Effectiveness of Fiscal Policy in Stimulating Economic Activity—A Review of the Literature,” IMF Working Paper, WP/02/208, (Washington, D.C.: International Monetary Fund).
- I.O. Ajao, F.J. Ayoola, J.O. Iyaniwura. (2015), Temporal disaggregation methods in flow variables of economic data: Comparison study *International Journal of Statistics and Probability*, pp. 36-46.
- International Monetary Fund (IMF 2015). Fiscal Policy and Long term Growth, IMF Policy Paper.
- Monacelli, T. and Perotti, R. (2006), Fiscal policy, the trade balance and the real exchange rate: Implications for international risk sharing, Mimeo, IGIER.
- Perotti R. (2005). Estimating the Effects of Fiscal Policy in OECD Countries. CEPR Discussion Paper No. 4842.
- Petrevski, G., Bogoev, J., & Tevdovski, D. (2015). Fiscal and Monetary Policy Effects in Three South Eastern European Economies. *Empirical Economics*, 50, 415-441. doi:10.1007/s00181-015-0932-0
- Ramey, Valerie A., (2016), “Defense News Shocks, 1889–2015: Estimates Based on News Sources.” Unpublished paper, University of California, San Diego.
- Riera-Crichton, Daniel, Carlos A. Vegh, and Guillermo Vuletin, (2015). “Procyclical and countercyclical fiscal multipliers: Evidence from OECD countries.” *Journal of International Money and Finance* 52(C): 15–31.
- Robert Barro and Charles Redlick, (July 2010)“Macroeconomic Effects from Government Purchases and Taxes”(working paper, Mercatus Center at George Mason University, Arlington, VA.
- Spilimbergo, A., Symansky, S., Blanchard, O. and Cottarelli, C. (2008), “Fiscal policy for the crises”, IMF staff position note, December 29, SPN708/01, 1-38.
- Stock, J., and Mark Watson. (2001). Vector Autoregressions. *Journal of Economic Perspectives*. Vol. 15(4). Pages 101-115.
- Управа за Јавни Приходи на Република Македонија. Retrived from ujp.gov.mk
- Wohlbier, F., Astarita, C., & Mourre, G. (2014). Consolidation on the Revenue Side and Growth-friendly Tax Structures: An Indicator Based Approach [European Economy, Economic Papers, No. 513/2014]. Brussels: European Commission.