

## The effects of fiscal-budgetary measures upon GDP, private consumption and investments – a VAR analysis

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**Abstract.** In this article we intend to characterize the dynamic effects of shocks in government expenditure (treated and components such as public spending for economic activities, social and cultural costs) and tax revenues of consolidated budget on economic activity in Romania the years 1999-2007, expressed by GDP, private consumption, investments.

**Keywords:** fiscal, consumption, investments, budgetary

### 1 Introduction

The purpose of this analysis is to better understand the effects of fiscal-budgetary policy on the Romanian economy, making a step in further studies using the model of type VAR (Vector Autoregressive) impact in shaping such policy. These models are useful tools, which fail to describe the economy as a stochastic dynamic system that responds to current and past shocks. They were used especially in analyzing the effects of monetary policy shocks, but recently have developed and which focuses on the direction of public policies.

Issues surrounding the largest of this analysis are those related to data, their existence in the first place, the possibility of a long analysis that provides reliable results because Romanian statistical feature is that provides partial data annual, but the period of analysis from 1990 to 2007, does not contain sufficient entries (maximum 17, while a serious analysis requires at least 30 entries for a series, as our series), so we analyzed the period 1999-2007 the quarters, which offered the possibility of an analysis as possible credible advantage but out of our area of interest important variables for which quarterly data we found (direct taxes, indirect taxes), which would have provided greater clarity analysis.

### 2 The approach

#### 2.1 The interactions between variables

To identify budgetary fiscal shocks we use the methodology proposed by Blanchard and Perotti<sup>1</sup> in 2002. In their paper, the authors identify fiscal shocks by exploiting the budget "decision lags (gaps decision) in the process of political decision, based on the assumption that income and discretionary

income are predetermined by reference to macroeconomic variables and information related to elasticity of fiscal variables to economic activity budget, identifying the automatic responses of fiscal-budgetary policy. The two use a VAR consists of three variables (GDP, direct public expenditure and net income) and, using data on U.S. economy discovers that budget expansionary fiscal shocks lead to increased output and a shock in government expenditure, private consumption reacts positive, while <sup>2</sup> reacts investments so that the response of GDP to a shock to one U.S. dollars of public expenditure amounts to approximately 50 cents in the fourth quarter, rising gradually to a maximum of 1.29 U.S. dollars at the the 15 quarter. These results imply a cumulative multiplier <sup>3</sup> (as well as the cumulative change in GDP rate to cumulative changes in public expenditure). Identification method proposed by Blanchard and Perotti in 2002 has been applied to U.S. data by Perotti in 2002 and Gall and others in 2006. Perotti in 2002 used a VAR consisting of 5 variables, which included the GDP deflator of GDP, public spending, tax revenue and net interest rate. Gali and others have used a VAR of four variables that included GDP, direct public expenditure, employment and the real interest rate. Their results reveal a higher cumulative multiplier: value increasing around the unit until the fourth quarter and approximately 2 in the twelfth quarter. The results on shock in government expenditure on GDP components have a positive response in the private consumption, while investment is not a relevant response.

To assess the effects of fiscal policy in France, Biau and Girard <sup>4</sup> 2005 have used a VAR composed of 5 variables, which included direct public spending, net tax revenue, GDP, inflation and interest rate. Their results show a cumulative multiplier effect of spending public of 1.9 in the fourth quarter and 1.5 in 12-lee quarter and a positive reaction of private consumption. Using data for the Spanish economy, the Castro and the basket <sup>5</sup> in 2006 found a positive relationship between public expenditure and output in the short term, long term, the public expenditure expansionary shocks are associated mainly with high inflation and a lower level of GDP site.

Summarizing the results of any tests that are performed by the authors VAR methodology specified above, concludes that a shock of direct public expenditure have a positive impact and relatively long-term effects on output and private consumption. Such results are an implication of all such models keynesistã but are also compatible with dynamic general equilibrium models characterized by rigid prices and the Ricardian or non-Ricardian consumers. There is no consensus regarding the effects on investment, but the following pages we try to clarify this issue and on data from Romania.

## **2.2 The sources and construction of data series**

The availability of quarterly data is as anticipated in the lines above, remains the main constraint to analyze the effects fiscal-budgetary policy in a VAR. Series for the period 1999-2007 for GDP and its components contain definitive data for the period 1999-2005, the semi-final data for 2006 and provisional data for 2007. Source is the monthly bulletins of the National Institute of Statistics of Romania in the period concerned. Data on the components of the general consolidated budget are taken from the monthly bulletins of the National Bank of Romania in the same period and in newsletters of MEF. Monthly data have been adjusted quarterly form by calculating a simple average of monthly and quarterly data were taken in the state that existed in that source. The data were seasonally adjusted, TRAMO-SEATS method, having been converted into real terms using the consumer price index in the first quarter of 2000:1. Series were log and multiplied by 100, to some and calculating the first difference.

### 2.3 VAR model. Methodology

In estimating the VAR model we start with the general form:

$$Y_t = a_{11}Y_{t-1} + a_{12}X_{t-1} + b_{11}Y_{t-2} + b_{12}X_{t-2} + c_1 + \varepsilon_{1t}$$

(In which, Y, X = 2 variables VAR, a, b, c = estimated parameters,  $\varepsilon_t$  = vector of innovations).

The shape of each variable in the system by the previous values of all other variables, including their values.

To assess the effects of fiscal-budgetary policy in Romania on output and its components use the following models:

- *Model 1:* 3 variables: public expenditure, tax revenues, GDP;
- *Model 2:* 3 variables: Expenditure on economic activities, social and cultural costs, GDP;
- *Model 3:* 4 variables: Expenditure on economic activities, social and cultural costs, private consumption and gross capital formation (investment level);
- *Model 4:* 4 variables: socio-cultural costs, expenses for economic activities, tax revenues, GDP)

Reduced form VAR model of type 1 model is:  
 $Y_t = A(L)Y_{t-1} + U_t$  where:

$Y_t \equiv [CH_t, VF_t, GDP_t]$  is a three-dimensional vector, assuming either deterministic trend or stochastic trend;

$U_t \equiv [ch_t, vf_t, GDP_t]$  is the form corresponding to residues reduced form, which will generally be different from zero correlation;

### 2.4 Identification of fiscal policy shocks budget

Identification strategy based on the work of Blanchard and Perotti Perotti's 2002 and the same year, seen as the standard's structural VAR literature, is based on the following assumptions: the relationship between residual terms of the reduced form model  $U_t$  and shocks structural  $V_t$  has the following form:

$$AU_t = BV_t$$

In this relationship it is assumed that shocks are independent and distributed independently, with equal covarianței matrix identity matrix. Only budgetary fiscal shocks have a clear economic interpretation in this analysis.

In determining the shock I began to express terms of residual as low as linear combinations of shocks in public spending, budgetary revenues and GDP as:

$$\begin{aligned} ch_t &= a_1GDP_t + a_2e_t^{vf} + e_t^{ch} \\ vt_t &= b_1GDP_t + b_2e_t^{ch} + e_t^{vf} \\ GDP_t &= c_1ch_t + c_2vf_t + e_t^{GDP} \end{aligned}$$

in which  $e_t^{ch}$ ,  $e_t^{vf}$  and  $e_t^{GDP}$  structural shocks are uncorrelated each other that we want to find.

The first equation shows that a sudden change in the level of public spending within a quarter may be due to one of three factors: the response to unexpected changes in GDP surprise by  $a_1 GDP_t$ , response to a structural shock of tax revenue, surprised by  $a_2 e_t^{yf}$ , or response to a structural shock of total public expenditure. A similar interpretation is suitable for the second equation, while the third equation shows that unexpected changes in GDP may be due to unexpected changes in public expenditure, tax revenue or other shocks.

The identification of this system started from the idea that the two coefficients,  $a_1$  and  $b_1$ , can capture the effects of two types of economic activity on public spending and the government levies: automatic effects of economic activity in terms of expenditure and revenue rules existing tax policy and discretionary adjustments made in fiscal policy rules in response to various events taking place in a quarter. Key identification procedure is the recognition that the use of quarterly data almost deleted the second channel. Data on fiscal-budgetary policy suggests that policy makers and legislators to be more than a quarter to bring a shock to GDP, analyze it, to take measures to pass through parliament.

A first impression over the fiscal-budgetary variables we can construct a visual analysis and the level of public expenditure and annual consolidated budget revenues in a given period. The evolution of the two indicators and consolidated budget balance is apparent in Table below:

**Table 1** The general consolidated budget of Romania 2003-2007

	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
<b>Total revenue</b>	<b>58,437.4</b>	<b>74,044.2</b>	<b>87,629.4</b>	<b>106,885.1</b>	<b>127,108.2</b>
% GDP	29.6	30.1	30.5	31.2	32.5
<b>Total expenses</b>	<b>62,727.1</b>	<b>77,737.5</b>	<b>89,897.8</b>	<b>111,984.9</b>	<b>136,556.5</b>
% GDP	31.7	31.6	31.3	32.7	34.9
<b>Deficit</b>	<b>-4,289.8</b>	<b>-3,693.3</b>	<b>-2,268.4</b>	<b>-5,099.8</b>	<b>-9,448.4</b>
% GDP	-2.2	-1.5	-0.8	-1.5	-2.4

*Source: bulletin of the Ministry of Economy and Finance*

*Note:*

*GDP in 2007 390,800.0 million lei*

*GDP in 2006 342,418.0 million lei*

*GDP in 2005 287,186.0 million lei*

*GDP in 2004 246,371.7 million lei*

*GDP in 2003 197,600.0 million lei*

Thus, revenues increased from year to year both in absolute amounts and as percentage of GDP. If we refer to the largest change in the decisions that led to reforming the tax system, ie the adoption tax system in flat 16% income individuals and legal entities, which were taxed at that time by 25% (legal persons) and the odds from 18% to 40%, according to portions of income (individuals) We can not say

that evolution is obvious dramatic figures, either in absolute or relative (that and thanks to the expansion of the tax base), but if you listen to the calculations made by the representatives of Romanian government must admit that the Romanians were left with 8 billion euro in your pocket. Public expenditure is, with some fairly small differences developments consolidated revenues, except that their level exceeds the revenue gained, registering a budget deficit, but that does not exceed the EU considered that the maximum level above which initiate the excessive deficit procedure.

Public decisions have created preconditions for maintaining economic growth at a high level, under accelerating structural reforms and strengthen public finances. Tax relief has a social component as stimulating work, helping to remove the light gray part of the economy and therefore encourages the production of income from multiple jobs.

It is known that the growth process can be influenced by appealing to the fiscal-budgetary policy measures, but the result can be expected and achieved only if the best tool to use tax-budget nature of such decisions in the context of monetary , economic.

## **2.5 Results analysis**

VAR models focuses on the analysis of "shock" the variables studied. An innovation is such that within error (residual) in the stochastic equation of the system. The main purpose of the analysis of VAR is to assess the effects of various shocks on variables of the system. Each variable is affected by its own innovations and innovations in other variables.

VAR analysis is completed in two important results: shock response function (impulse response function) and decomposition of forecast error variation (forecast error variance decomposition) or in other words, decomposition of the change.

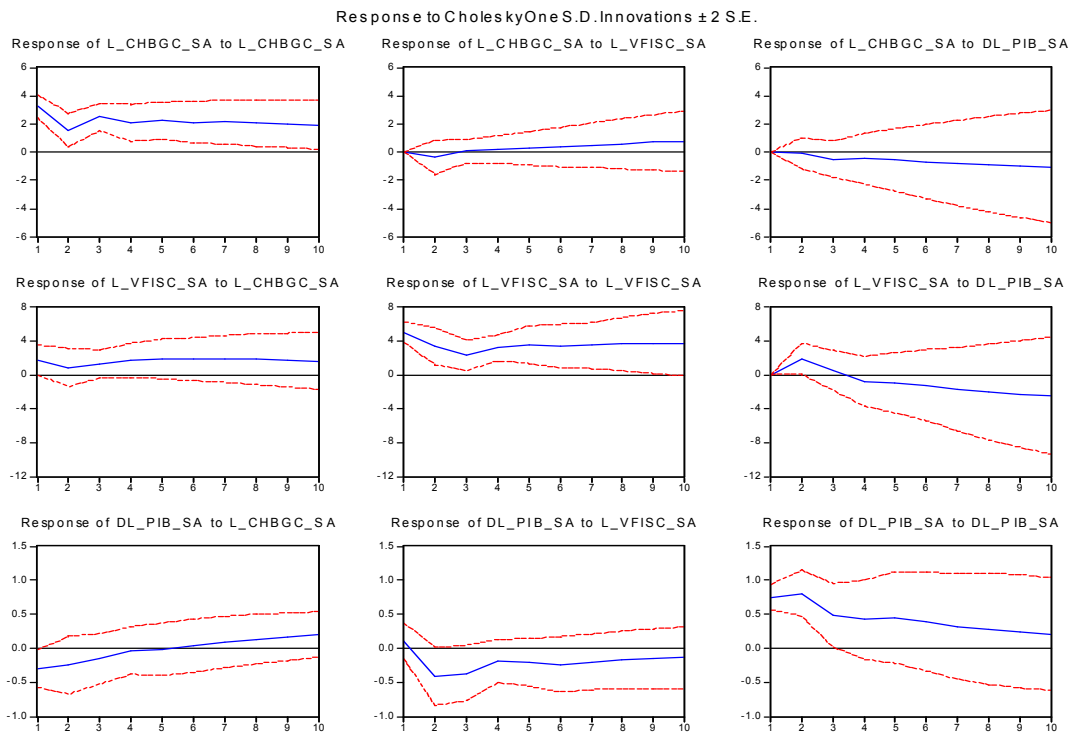
Impulse-response function intended effect they have given a variable shock on current and future values of variables in the system, describing the response of a variable to a shock in another variable, the sign of response and persistence of effects of various shocks.

The second result that needs attention from us is the decomposition of the change. It calculated the proportions of variation of a variable that own shocks and shocks due to other variables.

For reasons of space we play in this work only modeling results without highlighted the steps that were necessary to be done to achieve these results. We will present such impulse-response functions for each of these four models and then we characterize and decomposition change economic variables studied.

## 2.6 Function of impulse-response

Model 1:

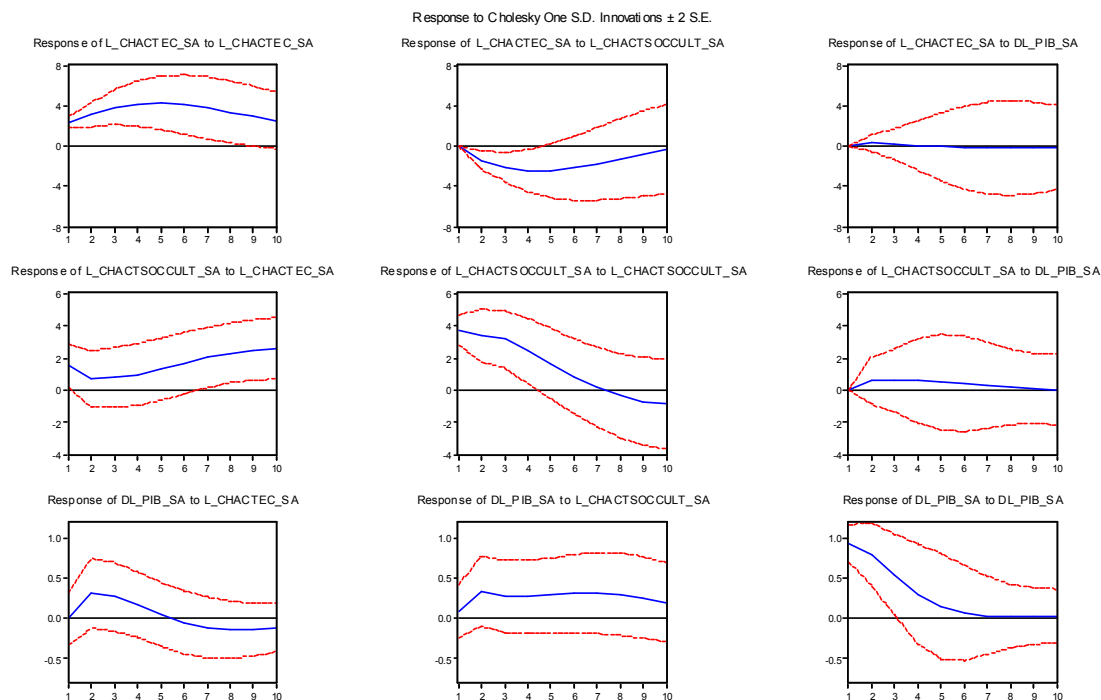


**Figure 1** Impulse-response function for model 1

In this figure there is a decrease in gross domestic product as a shock to tax revenue and an increase in output after a shock in government expenditure. In response to the shock of tax revenue, GDP decreases by approximately 0.4% in the second quarter and is followed by a slow increase during the next quarters. In studies developed by other authors<sup>7</sup> (which looked a 3-variable VAR that included tax revenues, public spending and GDP) shows a significant effect of a tax shock on GDP in Germany in the long term.

Public expenditure shock, induced GDP impact, it presented as an increase by 0.5 percent in quarter 3, the long term turns into a drop of about 0.25%. If we look at two parallel responses of GDP to changes in revenue and public expenditure, we can say that the total impact on output (and therefore the economy) is stronger if public expenditure and tax revenue not.

Model 2



**Figure 2** Impulse-response function for model 2

This figure shows an increase in gross domestic product by 0.4% in the second quarter following a shock of spending on economic activities. GDP response to increasing social and cultural costs follow the same procedure as mentioned reaction volume increase expenditures for economic action. All of this economic model results and decreasing costs in terms of increasing social and cultural costs.

For models 3 and 4 we summarize the main conclusions arising from impulse-response function (the same reason of space), namely: positive response (increase) in private consumption expenditure in terms of economic shock (approximately 0.5%) and social-cultural expenditures (about 3.7%) and if the response of investment to keep our same variables some reservations, the analysis identifies an initial response to their negative. As regards the function model confirms the results of 4 previous models, further actions are reactions to economic costs and social and cultural costs of a tax revenue shock (positive side, after about a quarter of non-response).

### 3. Conclusion – Decomposition of change

Model 1

**Table 2** Decomposition of GDP variation, model 1

Period (quarters)	L_CHBGC_SA	L_VFISC_SA	DL_GDP_SA
1	13.37362	1.678888	84.94750
2	9.680107	11.74261	78.57728
3	8.943874	16.25580	74.80033
4	8.118793	16.23359	75.64761
5	7.288592	16.32994	76.38147
6	6.759044	17.13479	76.10617
<b>7</b>	<b>6.693985</b>	<b>17.63473</b>	<b>75.67129</b>
8	7.030157	17.83706	75.13278
9	7.699833	17.96538	74.33479
10	8.745753	17.98830	73.26594

Source: own calculations

The results of this table shows that at a horizon of 7 quarters, for example, changes in GDP is explained in the proportion of 75.67% of their innovations. Budget fiscal shocks (those concerning public expenditure come to explain to a horizon of 7 quarters, for example, 6.69% of the variation in GDP in Romania, during which I took into account, while shocks in tax revenue at the same time explains 17.63% of the variation in GDP.

Model 2

**Table 3** Decomposition of GDP variation, model 2

Decomposition of change

DL_GDP_SA:			
Period (quarters)	L_CHACTEC_SA	L_CHACTSOCULT_SA	DL_GDP_SA
1	0.002238	0.901190	99.09657
2	5.493462	6.911245	87.59529
<b>3</b>	<b>7.578376</b>	<b>8.976196</b>	<b>83.44543</b>
4	8.184243	11.36330	80.45246
5	7.928661	14.17301	77.89833
6	7.716610	17.29212	74.99127
7	7.897384	20.24329	71.85933
8	8.340652	22.60286	69.05649
9	8.795961	24.19271	67.01133
10	9.109640	25.07865	65.81171

Source: own calculations

Table 3 shows that number, for example, a horizon of 3 quarters, the change in proportion of GDP is explained 83.44% of their shock, the economic costs of action explaining 7.58% of the variation in GDP, while expenditure on social and cultural activities explains 8.97% of gross domestic product variation.

Decomposition of change for models 3 and 4 may be characterized as follows:

- to a horizon of three quarters, private consumption is explained variation in proportion of 6.86% of the costs of economic shocks, the rate of 5.41% of expenditure for social and



cultural shock, while investment shocks explain about 2.45% of the variation and the shocks own explains most of it, of 85.26% (Model 3)

- in terms of decomposition is underlined change investments for the quarter that 5 of the analysis is explained at a rate of 11.34% of economic costs and private consumption variation explained 22.78% of investment (mode 3);
- model 4 show that the variation is explained 20.57% of GDP shock cultural social expenditure, while expenditure on economic activities explained 6.8% of variation.

In general, negative response Romanian output during the shocking review of the fees (government revenue) and the positive response to a public spending shock is inconsistent with keynestite models and the neoclassical model. The positive response of private consumption to a shock in government expenditure confirms keynesist standard type models. Also under such keynesistă effects include the positive response of GDP and a shock of spending on economic activities.

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