

## The estimation of the public investment multiplier in Romania

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**Abstract**— This study has been included in the larger theme referring to effectiveness of the fiscal policy tools for stimulating an economy which is affected by the economic crisis. The objective has been to settle the importance degree of the state's capital spending in stimulating the Romanian economic activity, under the terms in which the exit from recession is hardly anticipated for the end of 2011. The results obtained within an OLS regression are in compliance with those which have been calculated by OECD for the emerging countries from the Eastern and Central Europe. The multiplier of the public investments estimated for the period 2000:1-2010:1 has been 0.7, so that under the terms of increasing the state's capital spending by 1 Euro, the GDP has only increased by 0.7 Euro.

**Key words:** *fiscal policy; public investment; OLS regression; multiplier*

### I. INTRODUCTION

The current economic crisis has reopened the debate on the opportunity of using the public spending as an instrument for economic recovery and for the employment increase. The interest in identifying of the most efficient fiscal stimuli for re-launching the economies in crisis has increased, especially under the terms in which the expansionary monetary policy implemented by most of the central banks has not generated an increase of the private economic agents' confidence, and, consequently, an increase in consumption and in the private investments. In the Keynesian economic theory, the public spending have a higher impact upon the GDP, if compared to the transfers or to the level of taxes, as the latter ones do not generate a direct influence upon output, but they initially influence the available income and afterwards the level of the private consumption, to a lower extent [5]. According to this approach, the multiplier of the government spending is greater than 1, being higher for the countries which record a lower tendency towards import and for those which have a fixed rate of exchange. Other economic mainstreams (such

as those of rational anticipations, the real business cycle, and the economic institutionalism) deny the importance of the increase of the public spending in stimulating economy, as the multiplier is lower than 1 and it tends to zero as the time passes. According to these mainstreams, the individuals anticipate the future increase of taxes so that the budget deficits generated by the increase of the public spending could be covered, and thus a change in the living standard will not occur.

### II. HOW GREAT IS THE IMPACT OF THE PUBLIC INVESTMENTS UPON ECONOMY?

Theoretically, the public investments have a great short-term multiplying effect upon the aggregate demand and a long-term multiplying effect upon the aggregate offer, especially when they determine the decrease of the transaction costs. However, there are also other conditions which may influence the greatness of these spending' impact upon economy, in their absence the multiplier of the public investments being insignificant. *Firstly*, the government should make sure that will allocate sufficient financial resources for achieving the settled investment projects. Moreover, the local authorities should benefit from the central government's support whenever certain local projects may cease due to the lack of funds. Any cessation / blockage of the projects which are financed from the state budget would only generate temporary effects upon output, and the long-term multiplier will tend to zero or it will even become negative. Therefore, the economies which are characterized by a lack of multi-annual schedules for the investment spending or by radically changing the destination of the public funds depending on the election cycles will record a limited multiplying effect. State investments will not have a multiplier effect on economy and will be considered as a waste by the private economic agents. They will not desire to increase the taxes contribution level for their future projects, and any decision to increase taxation will result in the increase of tax evasion. *Secondly*, the public investment

projects should be transparent when referring to the spending and they should not be affected by the corruption spectrum. Its perception will result in losing the internal support for achieving any project of the state, but it will also block the achievement of efficient public-private partnerships for great projects.

The multiplier of the capital public spending is considered to be lower on a short term as a result of the temporal lags induced by the approval and the implementation of the new investment projects and its is considered higher on a long term as a result of the increase of capital stock and of the increase of the potential GDP [2]. According to Romp and DeHaan [7], the impact of the public investments is not linear, being generally lower in the developed economies and higher in the developing economies. According to the estimates made in a OECD study [6], based on the DSGE model (2009), the multiplier of the public investments is less than one on a short term in most of the analyzed countries (0.7 in Belgium, the Netherlands and Ireland, 0.8 in Germany, France, Italy and Great Britain, 0.9 in USA) and approximately equal to one on a medium term in Germany, France, Italy, Spain and Great Britain. The multiplier of the public investments in the Eastern and Central Europe (Czech Republic, Hungary, Slovakia and Poland) is 0.7 during the year when the investment takes place. Although on a short time it is lower than 1 within all OECD countries, the multiplier of the investments is the highest among the fiscal multipliers.

### III. THE RELEVANCE OF THIS STUDY FOR ROMANIA

In this study we explained to what extent the increase of the public spending may constitute an anti-crisis measure in Romania, under the terms in which the economy should cope with two major challenges. *The first one* refers to the deep recession that affected the Romanian economy starting with quarter IV of 2008, which determined the GDP contraction by 7.1% in 2009 and by approximately 2.6% during the first quarter of 2010. According to the latest forecasts, Romania will be the only Eastern and Central European country which has not exited the recession and it would record a 2% decrease during this year, as the decrease of consumption and of the private investments have neutralized the benefic influence generated by the increase of the Romanian exports along with the return of the economy within the Euro zone. *The second challenge* refers to the achievement of the fiscal consolidation process assumed by the government authorities along with the conclusion of the agreement with IMF in March 2009. According to this agreement, Romania committed to decrease the level of the budget deficit from 8.3% in 2009 to 6.8% in 2010 and to 4.4% in 2011.

On the one hand, the implementation of a restrictive fiscal policy may be considered to be totally inapplicable during this period of decrease of economic activity, as it will delay the economic recovery. On the other hand, implementing such a fiscal policy is necessary due to the errors made during the strong economic expansion years (2005 – 2008), such as the increase of pensions in a higher rhythm than to the wages increase, the increase in the number of employees in the public sector, the increase of

social assistance during the election years, which have generated an accumulation of higher and higher budget deficits. In order to implement a restrictive fiscal policy, the government has two major options: the increase of taxation and the decrease of the public spending. The increase of taxation might not generate additional revenues to the state budget due to the tax evasion and to the economic agents' tendency to re-locate in countries which have a lower taxation, so that the decrease of the state's spending seems to be the only valid choice to decrease the budget deficit on a long term. However, what type of spending should the government reduce so that it would not generate the medium-term extension of the recession? Considering the economic theory, the social transfers generate a lower impact upon economy, if compared to other types of spending, such as the procurement of goods and services by the state and the public investments, so that the decrease in the case of the firstly mentioned category could constitute a variant chosen by the Romanian authorities.

However, the economic reality may contradict the above conclusion, especially within the economies which are characterized by a high corruption in the case of the projects which are financed by the state (such as in Romania) or in the economies in which the absence of multi-annual budget programs may result in the definitive blocking of some investment projects, as in the case of Romania. That is the reason why, this study will make estimates on the impact of public investments upon output (GDP) in order to check to what extent the obtained results are in compliance with the theoretical approaches.

According to the 2010 State Budget Law, a percentage of 6.5% of the GDP was settled for the public investments, 60% of their sources being represented by the internal resources included in the budget, and the rest of 40% being represented by the pre-adhesion funds, the post-adhesion funds and the external credits. The objective of the financial allocation was to limit the rhythm of economic recession and to partially compensate the decrease recorded in the private sector activity.

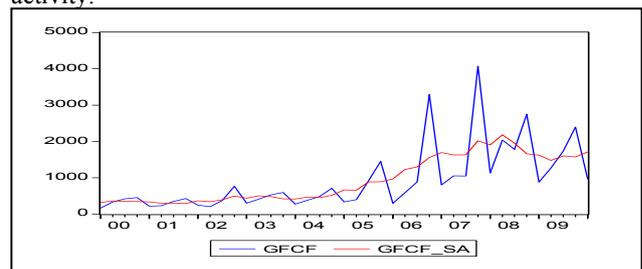


Figure 1. The evolutions of GFCF and GFCF seasonal adjustment

### IV. DESCRIPTION OF THE METHODOLOGY USED

In order to identify the multiplying effect of the state's capital spending, we have used series of quarterly data for the GDP and for the state's gross fixed capital formation (GFCF) during the period between 2000:1 and 2010:1, the data source being Eurostat. The dependent variable of the

OLS regression is the GDP and the exogenous variables are the lagged values of the GDP (outlining the autoregressive characteristic of this series of data), the lagged values of the state's capital formation (outlining the lag of transmitting the influences upon output) and a dummy variable for the purpose of outlining the structural breaks of the endogenous variable.

The presence of seasonality is obvious in the case of the spending for investments, under the terms of the absence of a multi-annual budget schedule (GFCF series in Fig. 1). The amounts which have not been spent during the first quarters (due to the delays in the development of certain investment projects) have been used during the 4<sup>th</sup> quarter of the year, mostly with other destinations than those mentioned in the initial budget schedule. This phenomenon accentuated beginning with 2005, along with the increase of the budget resources granted for investments. For example, in 2006 and 2007, during the 4<sup>th</sup> quarter, the spending were 50% higher than during the previous quarters, and the amounts exceeded 10% of the GDP corresponding to the 4<sup>th</sup> quarter. To remove the influence of seasonality, we have used the Tramo/Seats econometric procedure (GFCF\_SA series in Fig. 1), GFCF being expressed in millions of Euro, and in the prices of the previous year. As a result, the increase of the budget resources for investments have not also guaranteed the increase of efficiency in using them and, or, consequently, the increase of the impact upon the real economy.

The data series of the GDP is seasonal adjustment, being expressed under the form of annualized rhythms, compared to the same quarter during the previous year, the result being a number of 41 observations. In order to get the two data series in line, we have also expressed the seasonal adjustment series of the gross capital formation under the form of annualized percentage changes. As a result, the coefficient of the regression between the two variables will represent the GDP elasticity related to the public investments. The annual variation of the gross capital formation is much higher than the annual change of the GDP, as a result of the increase by approximately six times of the amounts granted for investments during those ten years. Thus, the average rate of increase in spending for investments was 35%, compared to an average of 4.2% of GDP increase. As for the GDP, the highest annualized increasing rhythm was recorded during the 1<sup>st</sup> quarter of 2000 (11.6%), and the highest decrease was recorded during the second quarter of 2009 (-8.7%). Moreover, during the last 5 quarters included in the estimate, Romania recorded decreases of the GDP (Fig 2). The most quarterly budget resources for investments were granted during the period 2007:4-2008:3, when the economy was still in an economic expansion. The actual recession was not counter-balanced by increasing the spending for investments, and thus they decreased by 20% during the 3<sup>rd</sup> quarter of 2009, compared to the similar quarter of the previous year.

Previously to testing the OLS regression, we have estimated the stationarity of the data series in order to identify the integration order for the used variables. The stationarity of a data series supposes that its stochastic features, respectively the average, the dispersion, the co-

variation, should be constant and they should not vary depending on time. Moreover, a stationary series tends to return to the average value and to fluctuate around it (it has a finite variation). On the contrary, a non-stationary series recorded a different average in various moments.

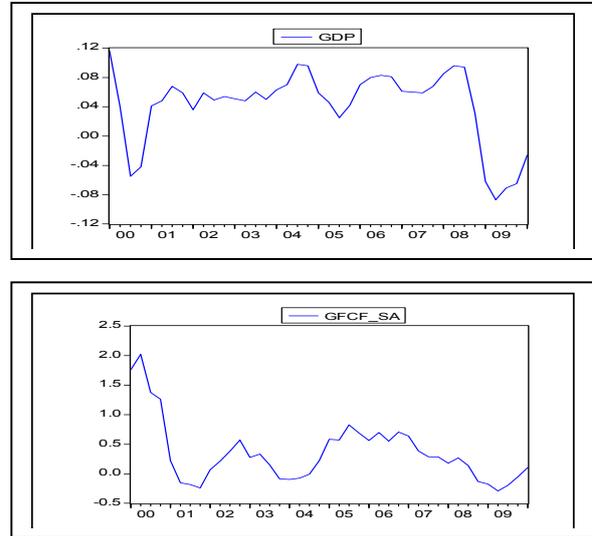


Figure 2. The annualized percentage change of GDP and GFCF\_SA

TABLE I. STATIONARITY TESTS

Critical values	GFCF ADF(0)	GFCF PP(0)	GDP ADF(0)	GDP PP(0)
t-statistic	<b>-4.545785</b>	<b>-2.978697</b>	<b>-3.750680</b>	<b>-2.370746</b>
1%	-3.615588	-2.624057	-3.610453	-2.624057*
5%	-2.941145	-1.949319	-2.938987	-1.949319
10%	-2.609066	-1.611711	-2.607932	-1.611711

Table footnote: \*) non-stationary at the 1% significance thresholds, but stationary at 5% and 10

Making an analysis according to the ADF and Phillips-Perron (PP) tests for the stationarity hypothesis for the two series, we may notice a presence of a stationarity of the two variables, thus allowing their use at the initial level (TABLE I).

For the purpose of considering the structural breaks of the GDP (the dependent variable within the model), we have created a dummy variable corresponding to the 1<sup>st</sup> quarter of 2009, marked as *dummy*<sub>2009:1</sub>, which corresponds to reversing the GDP evolution trend, marking its decrease by 6.2% subsequently to a period of continuous increase beginning with the 1<sup>st</sup> quarter of 2001.

## V. THE RESULTS OF ESTIMATIONS

Initially, we analyzed the GDP reaction to the change of the state's gross fixed capital formation by means of an OLS regression with the following form:

$$gdp = \alpha + \beta \cdot gdp(-n) + \delta \cdot gfcf(-n) + \phi \cdot dummy_{2009:1} + \varepsilon \quad (1)$$

Where,

$gdp$  – the annual economic growth rate;

$gfcf$  – the annual percentage change of the state’s gross fixed capital formation;

$n$  –the number of the quarters with which  $gdp$  and  $gfcf$  are lagged, outlining the impact upon the current  $gdp$ ;  $\varepsilon$  – residual of OLS regression;

$\alpha$  – regression constant;  $\beta$  – autoregressive coefficient of the GDP;  $\delta$  – the GDP elasticity depending on the GFCF;

$\phi$  –coefficient which outlines the dummy variable’s influence during the 1<sup>st</sup> quarter of 2009 upon the GDP.

For the purpose of estimating the regression coefficients, we have used the Eviews 6 software, the obtained results being included in TABLE II.

The results outline the existence of an autoregressive model of order 1, the  $\beta$  coefficient being 0.82, and this corresponds to a high dependence of the rate of economic growth during the  $n$  quarter on the rate of increase which was recorded during  $n-1$  quarter. The dummy variable included in the regression determined a decrease by approximately 9.6% of the GDP during the analyzed period.

TABLE II. THE RESULTS OF THE OLS REGRESSION

Dependent Variable: <i>gdp</i> ; Sample (adjusted): 2000Q4 2010Q1				
Included observations: 38 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
<i>gfcf</i> (-3)	0.016344	0.006345	2.575885	0.0145
<i>gdp</i> (-1)	0.824125	0.066810	12.33539	0.0000
<i>dummy</i> <sub>2009:1</sub>	-0.096317	0.020503	-4.697712	0.0000
C	0.004367	0.005192	0.841076	0.4062
R-squared	0.842149	Mean dependent var		0.043079
Adjusted R-squared	0.828221	S.D. dependent var		0.048734
S.E. of regression	0.020199	Akaike info criterion		-4.867106
Sum squared resid	0.013871	Schwarz criterion		-4.694728
Log likelihood	96.47501	F-statistic		60.46429
Durbin-Watson stat	2.015431	Prob(F-statistic)		0.000000

The public investments do not have an immediate impact upon the rate of economic growth, as the influence is transmitted with three quarters lags, and this is explained by the existence of a temporal lags between the actual spending of that money and the development of the state’s investment projects. The GFCF elasticity of GDP is 0.016, namely the 1% increase of the spending for investments determines an additional economic growth by 0.016% within approximately nine months. The selection of the third lag is also confirmed by the Granger causality test which outlines the extent to which the forecast of a variable can be improved by including another variable. According to the results of this test, which have been included in TABLE III, GDP can be the best forecasted by including the  $gfcf$  variable which is lagged by three lags, the probability related to thus

test recording a value which is even lower than the 1% rejection threshold related to hypothesis H0. Moreover, in the case of a very low probability (6.27%), the economic growth process also represents an instrument for the  $gfcf$  forecast within three quarters.

TABLE III. THE RESULTS OF THE GRANGER TEST

Granger test assumptions	Lags: 3 – 38 observations		Lags: 4 – 37 observations	
	F-Statistic	Probability	F-Statistic	Probability
<i>gfcf</i> does not cause Granger <i>gdp</i>	5.31416	0.00451	3.73340	0.01478
<i>gdp</i> does not cause Granger <i>gfcf</i>	2.69730	0.06287	2.40221	0.07357

Based on the elasticity coefficient, we calculated the multiplier of the public investment ( $\Delta GDP/\Delta GFCF$ ), according to below relation:

$$\delta = \frac{gdp}{gfcf} = \frac{\Delta GDP}{\Delta GFCF} \cdot \frac{GFCF_0}{GDP_0} \quad (2)$$

Under the terms in which the state’s gross fixed capital formation percentage of the GDP, corresponding to the initial period (1<sup>st</sup> quarter of 2000) was 2.26%, then the extent of the multiplier was 0.7 (= 0.016/0.0226). Thus, the increase by 1 Euro of the spending for investments determined the increase of the GDP by only 0.7 Euro after three quarters, and this constituted a proof for the absence of investments’ entailing effects recorded during the analyzed period and for the waste of the public money.

The estimated model meets all the conditions which provide its validity:

- 82% of the change of economic growth rate is explained by the exogenous variables included in the regression, and all the regression coefficients (except the constant) are significantly different from 0;
- the probability related to the Jarque-Bera test is 0.34, being higher than the 5% threshold, and thus hypothesis H0 of the normality in residual distribution is accepted;
- the probability related to the Breusch-Godfrey test is 0.58, and this corresponds to accepting the hypothesis H0 of absence of correlation in the regression errors; moreover, the same absence of autocorrelation is outlined in Table 2 by the value of the Durbin-Watson test;
- White Heteroskedasticity test has a probability of 0.30, which is higher than the acceptance threshold for hypothesis H0 referring to the regression homoskedasticity, thus confirming the absence of residual regression’s dependence on the model’s independent variables.

## VI. CONCLUSIONS

Subsequently to performing this study, we believe that the main reasons for a subunit multiplier of the public investments in Romania are the follows:

- the absence of a multi-annual budget schedule which blocks the achievement of great projects or the completion of the projects which have already been started;
- the dependence of the projects' objectives on the election cycle, as it generates a "new" prioritizing of the investments;
- the money which has not been spent for investments according to the budget granting settled at the beginning of each year; most of the amounts have been wasted by using them during the last quarter of each year during the period 2005-2008;
- the absence of medium- and long-term entailing effects upon the real economy; normally, these spending are mostly important for their long-term role upon the potential GDP;
- the absence of transparency in the case of the public money, this fact determining budget allocations which are higher than the actual spending for the achievement of the projects.

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