

Carp, Mihai; Vasiliu, Andreea

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THE IMPLICATIONS OF GROSS FIXED CAPITAL AND UNEMPLOYMENT RATE ON GENERAL GOVERNMENT DEFICIT. EMPIRICAL STUDY AT THE EUROPEAN LEVEL

Mihai Carp

“Alexandru Ioan Cuza” University of Iași

mihai_karp@yahoo.com

Andreea Vasiliu

“Alexandru Ioan Cuza” University of Iași

andreea_vasiliu_1986@yahoo.com

Abstract: *In this paper we have evaluated the influence of the modification of public investment level and unemployment rate on the general government deficit at the European Union level. We have created a regression model that shows that a sustained and increased investment policy and the reduction of unemployment rate have a favorable effect on the objective of minimizing the budget deficit. In the last years European Union's countries had to face a difficult problem concerning fiscal policy. They had to make public investments to stimulate economic growth and, in the same time, they had to meet the convergence criteria's of public deficit. On the other hand, EU has to deal with a higher rate of unemployment. Through our model we try to see how European Union countries should implement their political strategies on unemployment and investment with the main objective of reducing the general government deficit.*

Keywords: general government deficit, gross fixed capital, unemployment rate, correlation, regression.

JEL classification: C51, C52, H54, H62, J64.

1. INTRODUCTION

In the last years European Union faced a series of problems both political and economical. In an attempt to overcome the economic and financial crisis, European Union adopted new policies and procedures. However, some problems have not yet found the answer.

European Union faces a new problem concerning fiscal policy. On one hand, fiscal policy must create the appropriate economic environment to support growth by financing more and more investments projects and, on the other hand, it has to protect the macroeconomic stability, especially

the public deficit that must not be more than 3% of gross domestic product. Although many European countries have developed during the recent years new fiscal and investment policies under the European Economic Recovery Plan for restoring confidence in economy by strategic investments, large government budget deficits are still a concern in most European Union countries.

Another important problem is the unemployment rate and its implication on public deficit. High unemployment rate threatens most European economies. Each country increased its social expenses. Each European country must adapt its policy to face this problem. It is crucial to ensure the correct matching between labor market and supply if European Union members want to eliminate the effect of unemployment on public deficit.

2. THEORETICAL CONSIDERATIONS REGARDING PUBLIC DEFICIT, PUBLIC INVESTMENT AND UNEMPLOYMENT RATE

A government deficit is a common economic phenomena taking place at the national level. Government deficit or surplus represents the difference between current government receipts and current government spending in a single year. When the government spends more than it collects, a deficit occurs. The opposite of a budget deficit is a budget surplus. Usually the government deficit is the amount borrowed from the private sector.

A government deficit can be expressed using the following accounting relation:

$DEF = D_t - D_{t-1} = E + iD_{t-1} - TAX$, where D is the stock of public debt, E is government primary expenditure, i is the nominal interest rate on the debt and TAX is total revenues (Bayer and Smeets, 2009, p.7). From this way of defining it we can observe that the governmental deficit increases with governmental spending, nominal interest on the debt and decreases with government revenue.

At the European Union level, government deficit is defined in The Protocol on the excessive deficit procedure annexed to the Treaty establishing the European Community and in Regulation (EC) No 3605/93(2). Since 1992 European Union countries have been struggling to find a common policy concerning the deficit. First, the Maastricht Treaty established the convergence rule and reference value at 3% of gross domestic product for the governmental deficit. The same fiscal rule was reinforced in Stability and Growth Pact. It was necessary to use rules to limit the degree of fiscal policy discretion because governments spend more for purposes other than those of economic growth such as interest of political supporters, re-election (Castro, 2007). It is even more important to avoid excessive public deficit when the country takes part in a monetary union and to impose fiscal rules.

Public investments represent all the expenditures made by the government for the purchase of capital goods. Investments are divided into replacement investments and development investments. At the European Union level public investment procedures vary. They depend on how each member state understands to delegate these activities. There is well known that the Maastricht convergence process led a fall in public investment expenditures (Turrini, 2004). An important question regarding public investment is about its effects on public deficit. Although it is well known that public investment represents an economic development factor, an increase it will affect the governmental expenditures. Public investments in European Union countries decreased during the periods of fiscal consolidation that took place in the late '80 and in the '90 and in the period that precede the introduction of the euro (Turrini, 2004). The European Union fiscal framework on public investment requires that the most public expenditure, including those in investment projects will have to be founded from current revenues (Turrini, 2004, p.25). As a response to the negative impact of public investments on public deficit, Turrini says that the European countries must implement the golden rule. So 'the government should not attribute entirely to a single year's accounts the full cost of a project that is likely to generate gains for long time period. Since investments normally imply future return, their cost should consistently be distributed across several years, as return materialize' (Turrini, 2004, p.25). The implementation of this rule has the objective of avoiding the failure of European Union fiscal framework because of intense public investment policy.

Unemployment is a fact of not having a job, or being joblessness. It is a measurement reflecting the percentage of population that is looking for a job but is unable to find one. The indicator that measures the intensity of unemployment is one of the most important macroeconomics indicators. Unemployment rate is determined by dividing the total number of unemployed individuals by total active population currently in the labor force. It is expressed as a percentage.

At the European Union level there is a strategy concerning unemployment called The European Employment Strategy. It was developed with the purpose of encouraging exchange of information between member states and of finding solution to decrease the unemployment rate. It promotes innovation and investment. Although European economy is based on knowledge, unemployment rate is increasing with negative effect on wealth. The economic crisis raised the number of unemployed people.

3. LITERATURE REVIEW

The economic variables play an important role in explaining government deficits. During the recent years the efforts to develop economic models for explaining public deficits increased. The literature provides an important number of studies concerning the causes for public deficits. The general opinion is that governmental deficits are affected by the amount of public debt and economic performance.

Public debt is considered to be the principal factor for government deficit (Balassone and Francese, 2004). According to them a higher debt ration means an increase in interest payments and, of course, an increase in public spending.

Other studies consider the macroeconomic conditions as a factor of public deficit. When the economy is growing faster or when the unemployment rate is low the public deficit decreases (Castro, 2007).

The interest rate is considered to have a huge impact on public deficit. When there is a high interest rate the public deficit will increase because of the increase in interest expenditure on public debt (Castro, 2007).

The inflation rate is another factor of the modification of public deficit. The inflation rate is considered to have a directly negative impact on government revenues and expenses, on interest rate, on investment and economic growth (Tujula and Guido, 2004). Contrarily, Perotti and Kontopoulos (2002) argue that the higher the inflation rate is, the lower the deficit will be.

Another group of determinants of the public deficit are considered to be the political factors. According to political theory there are many ways of establishing the principal direction in economy. Some politicians are interested in inflation and unemployment and others in economic growth. Some have personal interests. This behavior causes changes in the level of deficit (Castro, 2007)

At the European Union level we are currently speaking about excessive deficits defined as being a deficit higher than 3% of gross domestic product. Studies on the causes of excessive deficits are undeveloped and few have developed econometric models to explain the factors that determine excessive deficits.

Bayar and Smeets (2009), concerned with the entry and exit dynamics of an excessive deficit, concluded that economic growth and higher governmental receipts have a positive effect on public deficit while expenditures have a negative impact. Taking into consideration the public debt, Bayar and Smeets (2009) demonstrated that the higher the debt is, the higher the possibility of having an excessive deficit will be.

In a study published in 2007, Vitor Castro estimated a conditional fixed effects logit model over a group of 15 European Union members. He demonstrated that ‘unfavorable economic conditions, parliamentary elections and political instability, and majority leftwing governments are important causes of excessive deficits in the EU countries’ (Castro, 2007, p. 29). In the same study he mentioned that the European Union fiscal policy ‘have been important in reducing the probability of excessive deficits in Europe’ (Castro, 2007, p. 30). Regarding the implications of the public debt on the increase or decrease of government deficit he argues that ‘the higher and more persistent the public deficit is, the more difficult for a country to avoid excessive deficits will be’ (Castro, 2007, p. 30). The study reveals also that the growth rate of real gross domestic product has an impact on public deficit. If government revenues increase and government expenditures on unemployment decrease, due to an unemployment decreases, then the probability of an excessive deficit will be reduced. Regarding political variables Vitor Castro sustains that the opportunistic behavior of policymakers is the main political cause of excessive deficits in the European Union area, ‘that the probability of an excessive deficit is reduced only two or three years after elections’ and that the political instability as an increase of the governmental changes per year is also affecting excessive deficits (Castro, 2007, p. 30).

Concluding, in the literature there are some models explaining the principal factors that determine governmental deficits. We showed the implications of public debt, interest rate, inflation, unemployment, macroeconomics condition and political factors on the increase of public deficit.

There are few studies regarding the implications of public investments and unemployment rate on the governmental deficit. The aim of this article is to fill a gap in theory and to explain how these two factors affect the governmental deficit.

4. EMPIRICAL STUDY

This paper aims to study the connection (links) and inter-linkages established between a number of variables that characterize the segment of national economic policies in the European area (budget deficit, investment, unemployment), with the ultimate objective of generating a statistical regression model to explain the influence of investment and unemployment on the budget deficit and to allow estimating the scale of the resultative factor on the basis of factor variables.

Statistical Hypothesis: The national budget deficit is influenced by the size of investments made in fixed assets in the economy and by the unemployment rate.

4.1 The description of the variables used in the regression model

The study was conducted in the European countries using the data compiled for the period 2008 – 2009 as showed in Annex 1. The source of information is represented by the European Institute for Statistics (Eurostat). The nature and characteristics of variables used in the model are summarized in Figure No. 1.

Figure 1- The variables used in the econometric model

Variables	Economic expression	Statistical expression
General government deficit/ Surplus	Represents positive or negative difference between forecasted budgetary resources and allocations expected to be achieved at the national level in a given period. The government sector includes national level, local level and social level. It was measured in euro and expressed as a percentage of GDP.	Dependent variable Resultative variable Quantitative dimension Expressed as a percentage of GDP
Gross fixed capital/ public investment	It is the size of fixed assets purchased or made by residents for use in the production process. It was measured in euro and expressed as a percentage of GDP.	Independent variable Predictor factor Numerically expressed as a percentage of GDP
Unemployment rate	Unemployment rate is determined by dividing the total number of unemployed individuals by total active population currently in the labor force. It is expressed as a percentage. (people between 15 and 75 years old)	Independent variable Predictor factor Numerically expressed as a percentage.

In the methodological approach was used multiple regression model using the SPSS 15.0 statistical tool.

The model equation could be expressed as the following one:

$$Y_i = \beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2, \text{ where:}$$

Y = dependent variable,

X_i = Independent variables,

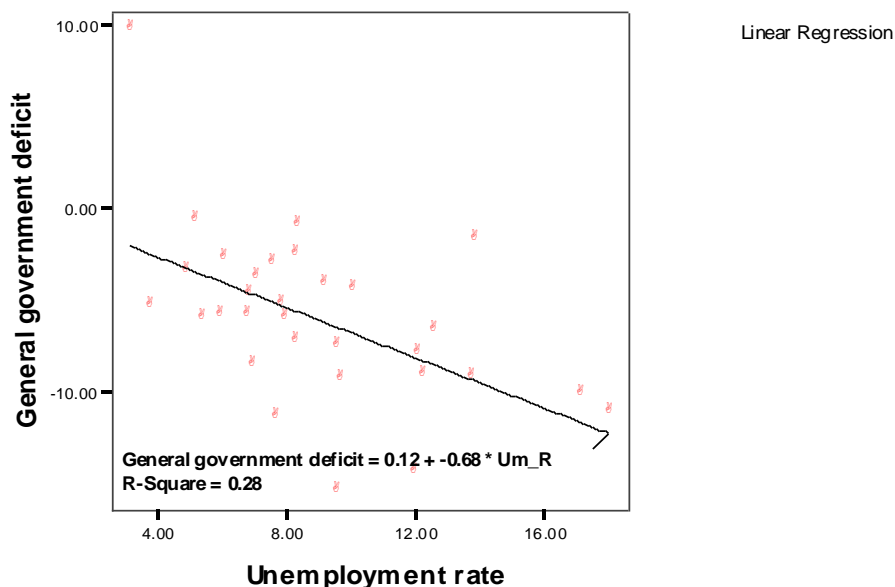
$B_{0..i}$ = regression coefficients.

4.2 The methodological approach and the interpretation of results

The first determinant step, in the correlation and regression analysis, in obtaining an effective statistical model, is the appropriate estimation of the model. In this case, we showed the existence

of a linear link between the variables. The correlation between the independent and the depended variables can be approximate as shown in the ScatterPlot figure below as being a linear regression model. The result of this initial step justifies the continuation of the analysis in this direction.

Figure 2- The correlations between unemployment rate and general government deficit



The study of the correlation established between the variables of the model, through the value of the coefficient of determination $R^2 = 0,31$, reveals that 31% of the variation of the general government deficit can be explained by the variation of the independent variables (fixed capital investment rate and unemployment rate). The difference is put on the account of randomness and other factors. Sig value is about 0,006, lower than the superior limit accepted of 0.05, showing that the linear model is validated through the Sig value. That means that the risk of being wrong when concluding that between the variables of the model is a strong correlation is less than 5%. Sig value, lower than 0.05, suggests that the linear model is the most appropriate one to express the correlations between variables. This step of analyze is presented in the figure below:

Figure 3- Model Summary- Linear regression model

Model Summary ^b									
Model	Statistics								
	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.557 ^a	.310	.261	3.99597	.310	6.293	2	28	.006

Table Caption

a. Predictors: (Constant), Gross fixed capital formation, Unemployment rate

b. Dependent Variable: General government deficit

The parameter's estimation of the regression model equation and the validation test results are showed in the Figure below:

Figure 4- Correlation Coefficients

Coefficients ^a									
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1 (Constant)	-5.254	5.191		-1.012	.320	-15.887	5.379		
Unemployment	-.673	.203	-.521	-3.318	.003	-1.089	-.258	.998	1.002
Gross	.267	.239	.175	1.116	.027	-.223	-.756	.998	1.002

a. Dependent Variable: General government deficit

The equation of the regression model, according to the data showed above, is the following:

Figure 5- The equation of the regression model

General government deficit	=	-5,24	+	0,267	Gross fixed capital	-	0,673	Unemployment rate
Sig value					0,003			0,027

Regression coefficient are: $B_0 = -5,24$; $B_1 = +0,267$; $B_2 = -0,673$.

The model reflects the influence of the independent variables on the general government deficit:

- If we maintain constant the investment rate, a percentage increase in the level of unemployment rate leads to reduction the budget deficit in average with 0.673 percent.
- When the unemployment rate remains constant, an increase of one unit of investment rate generates a growth rate of the budget deficit of 0.267 units, in average.

Sig values, lower than the limit of 0, 05, corresponding to the risk assumed in the analysis of regression coefficients, present significant link between the variables analyzed, also validating the model. The mathematical equation can be used as a tool for predicting the general government deficit when we know the value of the gross fixed capital and unemployment rate.

If we analyze the intensity of the influence of independent variables on the dependent variable showed in Figure-4, we can see a higher influence provided by the unemployment rate. The

influence of the unemployment rate modification on the budget deficit is three times higher than the influence of the level of investment on the same dependent variable.

To obtain a valid regression model and the relevant conclusions, is required an independent variables collinearity diagnostics. This implies the absence of influences between the predictors. We have to evaluate collinear statistics values such as: tolerance and variance inflation factor – VIF. In Figure-4 we can see that values for these two statistics. Tolerance's values closed to 1 and VIF's values lower than 10 suggest that the collinearity between independent variables does not exist.

Once we have approximated the linear regression model, we have to test it's linearity by using residue analysis process. From histogram and scatter plot charts showed below we can see that we have a normal distribution of the residuals around the mean which corresponds to the assumption of linearity of the model.

Figure 6- Linearity through Histogram

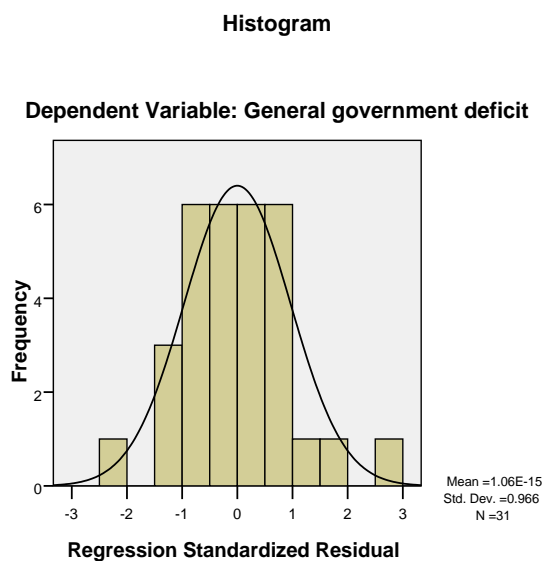
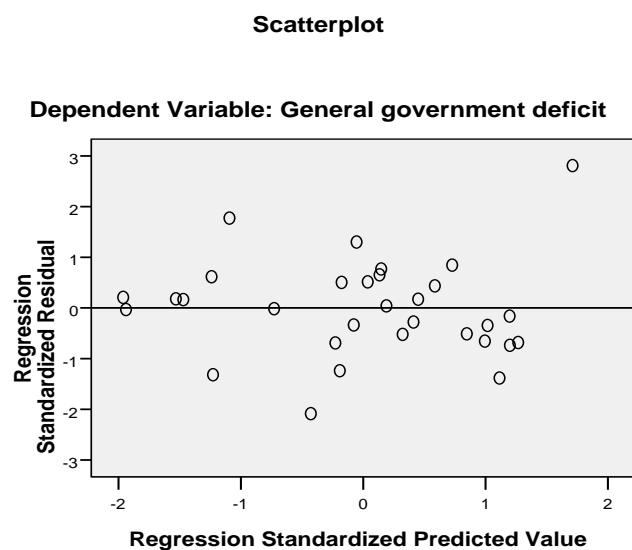


Figure 7- Linearity through Scatterplot



5. CONCLUSIONS

In the current economic situation in Europe, we notice the existence of a deep economic crisis, manifested in particular by the inability of governments to ensure coverage of the public expenses through revenues generated by public national economies. This imbalance reflected in the budget deficit, calls into question the opportunity of economic and social policies promoted by the European countries, highlighting the need to implement deep reforms, structural, in this field.

This article has highlighted the influence exerted on this imbalance by investment and occupational factors, confirming, also, the existence of correlations among them, quantifying their effects. Empirical study confirm authors acknowledge that a sustained and increased investment policy based on value will reduce the unemployment rate having a favorable effect on the objective of minimizing the budget deficit, the fundamental objective of economic and social stability of each state and the European Union as a whole.

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Annex 1- Data on government deficit, unemployment rate and gross fixed capital

Country	Government deficit	Unemployment rate	Gross fixed capital
Belgium	-6,00	7,9	21,3
Bulgaria	-4,70	6,8	24,4
Czech Republic	-5,80	6,7	22,5
Denmark	-2,70	6	18,2
Germany (including forme	-3,00	7,5	17,6
Estonia	-1,70	13,8	21,6
Ireland	-14,40	11,9	15,5
Greece	-15,40	9,5	17,2
Spain	-11,10	18	24
France	-7,50	9,5	20,6
Italy	-5,30	7,8	18,9
Cyprus	-6,00	5,3	20,4
Latvia	-10,20	17,1	21,5
Lithuania	-9,20	13,7	17,1
Luxembourg	-0,70	5,1	17,3
Hungary	-4,40	10	20,9
Malta	-3,80	7	15,4
Netherlands	-5,40	3,7	19
Austria	-3,50	4,8	21,1
Poland	-7,20	8,2	21,2
Portugal	-9,30	9,6	19,4
Romania	-8,60	6,9	25,6
Slovenia	-5,80	5,9	23,9
Slovakia	-7,90	12	20,6
Finland	-2,50	8,2	19,5
Sweden	-0,90	8,3	17,8
United Kingdom	-11,40	7,6	14,7
Iceland	-9,10	12,2	13,9
Norway	9,70	3,1	21,8
Croatia	-4,10	9,1	24,7
Turkey	-6,70	12,5	16,9

Source: European Institute for Statistics (Eurostat), Statistic database,

<http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes>.