The Effects of the Structural Funds on the Romanian Economic Growth

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Abstract: The European funds are considered an attractive tool for supporting economic growth on short-term and at a macroeconomic level. The impact assessment of structural and cohesion funds on Romania's economic growth is sluggish because of the mismatches between official information at national and regional levels. The role of economic models in quantifying the impact of structural and cohesion funds at a macroeconomic level cannot be minimized. This paper aims to investigate the impact of European funds totally absorbed by Romania on the evolution of total GDP (Gross Domestic Product) in the period 2007-2015. Using linear regression in R (lm function), our goal is to explain the relationship between attracted European funds in total, as an independent variable, and the Gross Domestic Product which was considered a dependent variable. For data processing, the authors used the ANOVA software. However, the results shows that the impact of the absorption rate on short-term economic growth does not confirm the theoretical expectations.

Keywords: European Funds; Gross Domestic Product; economic growth

JEL Classification: C1; E6; O1

1. Introduction

The implementation of regional policies is based on Structural Funds, considered to be the most valuable instruments with the help of Member States' contributions, relative to their economic strength. The European Commission outlines the main directions on regional policy objectives for each stage of programming. Member

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States formulate regional development multiannual programs able to attract funding with the help of structural instruments.

The Europe 2020 strategy brings new changes on stimulating a new type of smart, sustainable and inclusive growth by: increasing the quality of skills and maintaining education during life, developing research and innovation, efficient use of smart grids, the digital economy, refurbishment and extension of industry, efficient use of energy and resources, promoting an economy with a high rate of employment, ensuring social and territorial cohesion; strengthening governance through: regular and transparent monitoring, taking decisions at high levels, advice, warnings, penalties; closer economic coordination, reports on economic reform programs and stability and convergence programs, the provision of funds necessary for financing programs [1].

Assessments regarding the absorption of European funds have emphasized the fact that the economic crisis had a strong impact on the operational programs and the implementation of crisis, being responsible for the lack of progress, reduced demand for grants under these programs, the lack of co-financing capacity for public and private beneficiaries, investor hesitation, and limited resources. In the context of the global economic crisis, any form of financing for Romanian environment is essential, which is why a study on the impact of absorption of European funds is relevant in identifying and defining any difficulties encountered and the ways to overcome them [2].

In Romania, an important part of the literature regarding the EU funds focuses on the factors which influence the absorption rate capacity on economic growth, but also the institutional and corruption problems [3-4]. Those specialists say that the funds allocated to Romania by the European Union through the cohesion policy instruments will successfully contribute to the attenuation of social, economic and territorial disparities, taking into consideration the fact that they could generate Romania's economic growth, durable development and financial stability. Other experts in the field say that the European funds do not allow the economy to develop naturally, but they teach the company administrators to fill in forms and financing requests to make their investments and that they are making them forget the classical financing mechanisms and principles that would truly contribute to the economic development of a state [2].

The ability to build models by means of which to represent more adequate systems which it relates to has greatly increased in the recent decades due to both the development of operational research, which provide managers more and more types of models form the prefabricated, and the opportunities to appeal to an increasingly powerful computer able to test validity and solve models.

It is necessary that equations of the macroeconomic model which analyses the impact of European funds' absorption rate on the Romanian economic growth rates be

recalibrated annually, by extrapolating time series with a record of each variable for the input-output tables. The model must be detailed in the perimeter of structural fund impact on production factors, in order to take the indirect effects of the injection of structural funds.

Macroeconomic models (HERMIN, HEROM and QUEST) have the capacity to capture reactions that occur in economy and to estimate costs and benefits in the society as a whole. Unlike in pure econometric models, which may not be large due to the lack of data on long horizons of time, models of overall balance hybrid - statistic calibration type have the advantage of being able to separately analyses several institutional and economic sectors and to study the impact of economic policies on distinct sectors. [5,6,7,8].

Major deficiencies are derived from the fact that most parameters depend on the amount of resources used. The quality of models is in turn closely related to the quality of the coefficients and applied elements, which are difficult to validate. However, the limitations of these models should be viewed with caution, particularly in the Romanian economy, where statistics are insufficient or inadequate for econometric assessments, given the specificity of the transition period and reduced time range for essential variables, such as those relating to capital and types of investments (infrastructure, machinery and equipment etc.).

This article brings a new look to the impact of European funds totally absorbed by Romania on the evolution of total GDP (Gross Domestic Product) in the period 2007-2015. The main aim of this study is to deepen and discover a reality which is more or less known at the level of common sense. More importantly, the results of the present study suggest that the impact of the absorption rate on short-term economic growth does not confirm the theoretical expectations.

This paper is organized as following: section 2 describes the methodology and the data, section 3 is dedicated to the results, and section 4 concludes and addresses some policy implications.

2. Methodology and Data

Macroeconomic, multi-sectoral assessments are tools that can confer a holistic approach on the economy based on computer-assisted mathematical models. Their use involves applying econometric techniques based on long-term statistical data and a transition towards equation models, assessment of financial flows, detecting directions in which changes of the economic structure, labor or revenues and expenditures occur.

The regression function is usually used in making numerous micro- and macroeconomic analysis. After a logical study of the variables to be analyzed, we

will continue with a graphical representation of data series, along with a primary interpretation, showing the substantiating of the econometric model used.

To build a linear regression model, EU funds were established per year and attracted European funds in total, as independent variable, while the Gross Domestic Product was considered a dependent variable.

To determine the linear regression model parameters, we considered two models:

- Model with one independent variable (absorbed European Funds per year)
- Model with two independent variables. (European Funds absorbed per year and Total European Funds).

In this first model, the dependent variable was considered the Gross Domestic Product (GDP) and the independent variable, absorbed European Funds (EF), with nine comments (2007-2015). The evolution of GDP and the rate of absorption of European Funds are presented in Table 1.

Table 1. The evolution of GDP and the rate of absorption of European Funds (thousand euro)

Year	European Funds per year	Total European Funds	GDP (Y)
2007	323	400	123700
2008	653	1100	139700
2009	903	2000	118300
2010	519	2500	124100
2011	692	3200	131500
2012	1153	4300	132600
2013	2920	5100	144700
2014	3554	8600	150800
2015	2229	11200	159000

Source of data: Authors representation based on information extracted from Ministry of European Funds, Romanian National Institute of Statistics and National Bank of Romania [9-15].

Also, match up with the data in Table 1, the regression equation is:

$\overrightarrow{GDP}$ = 122,959 + 5,142 (EF), where

122,959 is the intercept (the place where the regression ordered intersects OY, i.e. the value of Y to X = 0)

5,142 is the slope of regression (show how increase $\overrightarrow{GDP}$ when X increase by 1 unit)

Moreover, through GDP it is estimated by the model and the value 5,142 is the ratio of standard deviation with EF, multiplied by R the coefficient of correlation between X and Y

$122,959 = M\ GDP – 5,142 * M_{EF}$

where M_{GDP} represents the average GDP and M_{EF} represents the average of EF

In the second model, the dependent variable was considered the GDP and two independent variables with 9 comments (2007 – 2015). The independent variables are the European Funds (EF) absorbed per year and Total European Funds (T EF) totally absorbed. Also, match up with the data in Table 1, the regression equation is:

$\overrightarrow{GDP}$= 121,051 + 0,003FE + 0,003 TEF (Total European Funds)

The reason behind the two models was to show the effect that these funds have had in the evolution of the GDP in the analysed period of time, respectively 2007-2015.

3. Results and Discussions

Table 2 and Table 3 show the results of ANOVA used the data in Table 1. It is shown that there are the significant differences between the Gross Domestic Product and absorbed European Funds (EF) per year ($p<0.01$). The results support our predictions regarding model 1 with one independent variable (absorbed EU funds per year) and further analyses the mean value of the Gross Domestic Product.

Table 2. Regression to determinants differences between the GDP and absorbed EF per year

	df	**SS**	**MS**	**F**	**Significance F**
Regression	1	873,0189 73	873,0189 73	10,14492 49	0,015380901
Residual	7	602,3832 49	86,054749 9		
Total	8	1475,402 22			

	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95%**	**Lower 95.0%**	**Upper 95.0%**
Intercept	122,959	5,141959 944	23,9129	5,69E-08	110,8026	135,1179	110,8026	135,117867
EF	0,00903	0,002834 178	3,18511	0,015381	0,002325 4	0,015729	0,002325 4	0,015728 93

Notes: Dependent Variable: Gross Domestic Product; significant at $\alpha = 5\%$

Source: Primary data (processed)

Table 3. Residual Output – model 1

Observation	Predicted GDP	Residuals	Standard Residuals
1	126,7775555	-3,077555503	-0,354661825
2	128,853804	10,84619597	1,249930879
3	131,1105959	-12,8105959	-1,47631109
4	127,6441636	-3,544163582	-0,408434396
5	129,2058636	2,294136441	0,26437951
6	133,3673878	-0,767387773	-0,088434846
7	149,3183927	-4,618392735	-0,532230075
8	155,0416169	-4,241616926	-0,4888099
9	143,08062	15,91938	1,834571743

Source: Primary data (processed)

Correspond to model 1, to identify the type of regression function, there was performed a graphical representation of the pairs of points that comprise the gross domestic products and those of European Funds attracted (Figure 1 and Figure 2). The mean value of European funds significantly varied from 3.07 to 4.24 when the evolution of GDP by European funds increased from 126.78 to 155.04. The results supported our predictions regarding model 1 with one independent variable (absorbed EF per year). It is important to remember that, according to the graphics, there is no correlation between the independent variable and residuals, the model being chosen accordingly.

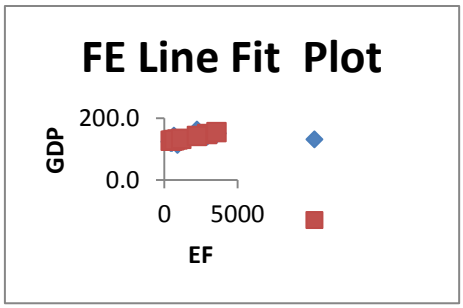

Figure 1. The residual graph as function of attracted European funds

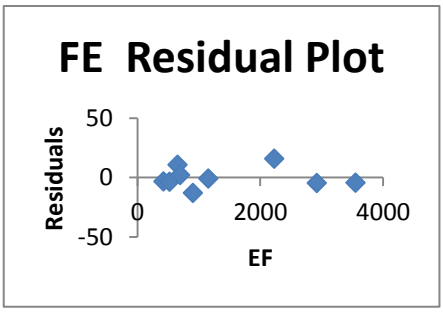

Figure 2. The graph represents the evolution of GDP by attracted European funds

In the case of the model 2 with two independent variables (European Funds absorbed per year and Total European Funds), the results Table 4 and Table 5 show that there are the significant differences between the Gross Domestic Product, absorbed European Funds (EF) per year and Total European Funds ($p<0.01$).

Table 4. Regression to determinants differences between the GDP and absorbed EF per year

	df	SS	MS	F	Significance F
Regression	2	1120,647185	560,323592	9,476797	0,013901268
Residual	6	354,7550375	59,12583396		
Total	8	1475,402222			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	121,051	4,362993507	27,74484	1,4E-07	110,374697	131,7264	110,3747	131,7264
EF	0,00295	0,003788014	0,777689	0,4663	-0,006323	0,012215	-0,00632	0,012215
	0,00251	0,001228124	2,046498	0,08666	-0,0004918	0,005518	-0,00049	0,005518

Notes: Dependent Variable: Gross Domestic Product; significant at α = 5%

Source: Primary data (processed)

Table 5. Residual Output – model 2

Observation	Predicted GDP	Residuals	Standard Residuals
1	123,3020142	0,397985761	0,059765181
2	125,7389186	13,96108137	2,096523652
3	128,7374118	-10,43741176	-1,5673772
4	128,8628636	-4,762863598	-0,715235154
5	131,1318518	0,368148236	0,055284506
6	135,2546003	-2,654600288	-0,398639055
7	142,4706863	2,229313675	0,334774128
8	153,1351246	-2,335124562	-0,350663659
9	155,7665288	3,233471169	0,485567601

Source: Primary data (processed)

The mean value of correlation coefficient of 0.87 and a coefficient F = 0.01 presented in Table 6 indicates the consistency of the multiple regression model (0.01 < 0.05). In conclusion, the results supported our predictions regarding model 2 with two

independent variables (European Funds absorbed per year and Total European Funds).

Table 6. Summary Output – model 2

Regression Statistics	
Multiple R	0,871523768
R Square	0,759553678
Adjusted R Square	0,679404904
Standard Error	7,689332844
Observations	9

Source: Primary data (processed)

Consistent with the graphics below, there is no correlation between the independent variable and residuals, the model being chosen accordingly (Figure 3, Figure 4, Figure 5 and Figure 6).

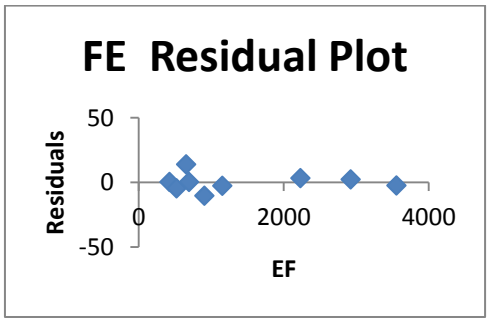

Figure 3. The graphic represents residual errors of GDP because of independent variable EF

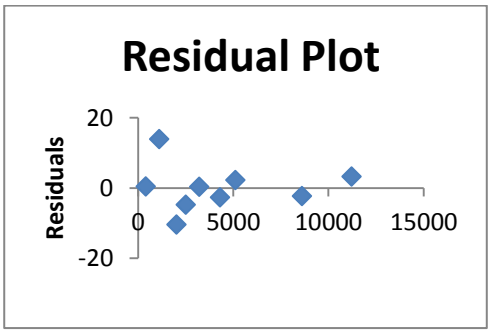

Figure 4. The graphic represents residual errors of GDP because of independent variable TEF (Total European Funds)

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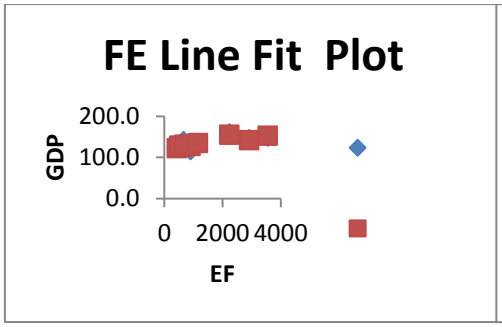

Figure 5. The EF graphic and the values computed based on the resulted model and GDP

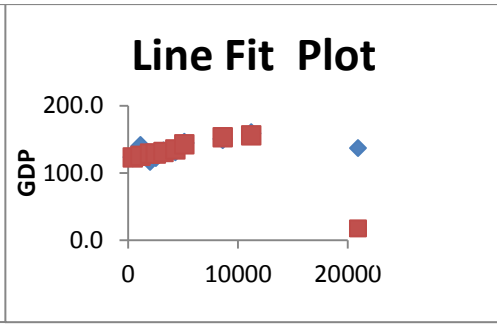

Figure 6. The GDP graphic function by EF

Given the analysis and interpretation of the data obtained in the two models, we can observe that the growth of the absorption rate of European funds in areas which promote investments and export could create stability and consistency upon the evolution of the Gross Domestic Product (GDP).

4. Conclusions

The absorption of European funds for Romania is a chance to recover from the social and economic gaps in order to become a competitive state in comparison with the rest of EU Member States. Low uptake is associated with the ability to regulate the spending of these funds. The potential conflicts of interest and falsification investigations reported in the media constitute effects of the lack of capacity to exercise effective control over the management of these funds from the responsible institutions.

The impact assessment of European funds in Romania starts with the evaluation of the achievements to date, the steps to be taken in the future, but also with the failures to understand the areas where we need to do more work and change things.

The present study shows that the two independent variables model is based on a high correlation coefficient of 0.87 and a coefficient F=0.01, which indicates the consistency of the multiple regression model (0.01 < 0.05)

Also, the value of the coefficient 5,142 (representing European Funds model with one independent variable) indicates that in the considered period (last 9 years), the increasing absorbed EF by 1 unit has as a result of GDP growth by 5 units.

In the other words, the impact of the absorption rate on short-term economic growth does not confirm the theoretical expectations. Contrary to the effects of the structural funds on the Romanian economic growth, the necessity to increase the impact of

European Funds must start solving the problems associated with the capacity of spending these funds.

Solutions, proposals and courses of action to achieve the objectives, ensuring Romania's evolution in social and economic terms: the expertise of specialists in regional development, to ensure communication channels; encouraging cooperation between institutions, universities, public administrations and businesses; periodic training of persons seeking access to European funds; cutting red tape; facilitating access to information for all business actors, institutions; providing an updated database of region-wide development for real and concrete analysis.

The paper could serve as a starting point for future research that includes new variables from each Romanian region itself.

In the years 2014 – 2020, in order to ensure that the impact of European investments on growth and jobs is not undermined by unsustainable macroeconomic policies or weak administrative capacity, the Commission can ask for a review of the programs or suspend the funding if no corrective action is taken. The impact of the funds will also be strengthened by simplifying and harmonizing the rules of different funds, including those related to rural development and maritime affairs and fisheries. A single set of rules will apply for five different funds. Also, a more integrated approach will ensure that the various funds meet consistent objectives and mutually reinforce their effects.

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