

HOW CAN THE ECONOMIC GROWTH BE AFFECTED? STATISTICAL ANALYSIS FOR ROMANIA

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This paper investigates the direction of causality between economic growth and credit market development in Romania for the period 2001–2009 using quarterly data and applying the statistical method under SPSS program. The results provide the evidence in support of the fact that the credit market development is correlated with economic growth, inflation rate and exchange rate. We used the linear regression method and we analysed both the correlation between dependent variable and independent variables, and obtaining necessary coefficients for determining the regression equation. The conclusion is that, in Romania, on the base of the data for the period analysed, a short-run increase of bank lending with 1 mil. RON induces a relative decrease of economic growth with $3.96 \cdot 10^{-5}\%$, an increase of inflation rate per 1% induces a decrease of economic growth with 0.32%, and an increase of exchange rate per 1 determines a decrease with 4.9% of economic growth.

Key words: credit market, economic growth, linear regression method.

INTRODUCTION

Banking sector influences to a great extent the economic activity, being a strong correlation between functioning of financial-banking sector and long-term economic development, its stability being extremely important for any economy.

On the last years, in all contries, it was given a great importance to the problems of financial-banking situation, as financial sector and, especially the banking one, were and still are very vulnerable to systematic crises. Because of weak transparency and banks refuse to give some detailed information, it is apreciated that these represent the real “black boxes” (Hyytinen& Takalo, 2002 and 2004).

Thus, the relationship between economic growth and credit market development has been an extensive subject of empirical research, being demonstrated that there is a correlation between them. The question is that what is the direction of

the causality relation between economic growth and credit market development?

The main objective of this paper is to investigate this relationship for Romania taking into account the effect of inflation rate, bank lending and exchange rate over economic growth, using quarterly data for the period 2001–2009, offered by National Institut of Statistics and National Bank of Romania.

The methodology of our research consists on applying the statistical method under SPSS program, using the linear regression method. We will analyse both the correlation between dependent variable and independent variables, and the necessary coefficients for determining the regression equation.

In the present economic circumstances by economical-financial crises on the world-wide level, for Romanian economy, the banking sector has a great importance, being a key factor for supporting of economic growth.

THEORETICAL CONSIDERATIONS

Numerous theoretical and practical studies demonstrate that a strong financial sector support economic development, most of them usually conclude that the development of the credit market accelerates economic growth. For instance, Schumpeter (1934) emphasized the role of banking sector as financier of productive investments and, in this way, an accelerator of economic development. Another early evidence which demonstrated that development of financing accelerates economic growth was in the paper of Goldsmith (1969).

Pagano (1993) infers three methods of influences of financial sector development will be able to influence economic development: (1) it rises the investment productivity; (2) it reduces transaction costs, and in this way it can rise the savings; (3) it can either to promote, or to reduce the savings.

Jappelli and Pagano (1994) develop a model in which the younger generation borrows extensively when no liquidity constraints accompany the liberalisation of consumer credit and mortgage markets.

A study applied for analysis of relationship between credit market development and economic growth in Italy for the period 1965–2007 indicates that „bank development is determined by the size of bank lending directed to private sector at times of low inflation rates leading to higher economic growth rates. Businesses make new investments to innovative products through bank lending in more developed countries,, (Vazakidis and Adamopoulos, 2009).

Another model applied on the relation economic growth-financial development was the model of augmented production function, which can explore a possible channel by which the banking industry can make its contribution to the productive capacity of the economy (Ho, N. W., 2005).

Levine realised a lot of studies cross-country data regarding the correlation between financial sector and economic growth. Thus, together with King (1993), they measured financial sector development for 80 countries using four variables: the amount of liquid liabilities divided by GDP, the importance of commercial banks in relation to central bank when allocating credit, the ratio of credit allocated to private enterprises to total domestic credit, and credit to private sector divided by GDP. "After controlling for other factors affecting economic growth, King and Levine find a

strong positive relation between each of the financial development indicators and economic growth" (Koivu, 2002).

Levine (2002), analysing the correlation between financial structure and economic growth (Real per Capita GDP Growth) for 48 countries over the 1980–1995 period, underlines the critical importance of the banking system over the economic growth and reveals the circumstances when banks can actively stimulate the future growth by identifying and funding productive investments.

On the other hand, the conclusions of other research in transition countries stress out that "due to specific characteristics, the growth in credit has not always been sustainable and in some cases it may have led to a decline in growth rates" (Koivu, 2002). Thus, analysing the relationship between the amount of credit to the private sector and economic growth in 25 transition countries (including Romania) during 1993–2000 period, Koivu (2002) demonstrated that their causality seems to run mostly from economic growth to credit growth. This outcome is justified by the characteristics of transition economies and the line of the financial market development in transition countries. The author noted following: (1) banking crises rocked the financial sectors of many countries during the first decade of transition, thus, large amount of credit could have led to significant drops in GDP growth; (2) the soft budget constraints still prevalent in many transition countries have encouraged private sector actors to make counterproductive investments, thus the banking sector does not promotes high economic growth; (3) the size of the financial sector is not a good variable to measure the development of effectiveness in the sector in transition countries.

We can say that, on the background of the analysis of Koivu from 2002, including the data of banking system from Romania in correlation with economic growth, our conclusion for the period 2001–2009 is the same after around ten years: the growth of private credit does not encourage the economic growth, leading to a relative decline in economic growth rates.

DATA SOURCES AND METHODOLOGY

For our research, we used quarterly data offered by National Institute of Statistics and National Bank of Romania for the period 2001–2009. As research method, it was applied the backward method of linear regression (which

consists of frequentative elimination of independent variables which have the most insignificant influence to dependent variable) into SPSS (Statistical Package for the Social Sciences) program (method tested on Table 2).

The variables are:

- economic growth rate (real quarterly growth rate of GDP) for what was verified the correlation as dependent variable;
- the total credit, the average exchange rate RON/EURO and inflation rate, as independent variables.

As it is presented into the Statistical Year Book of Romania, after a decline period between 1997–2001 of GDP, **economic growth** was raised the bid starting with 2002. The growth was determined, significantly, by rising of activity from service, construction and industry fields. The effective final consumption and, especially, individual final consumption of households had registered a high growth determined by, distinctively, the rising of goods sales through retail trade, and the population services activity. Also, the gross fixed capital formation and, especially, the investment level had registered substantial growths.

The economic growth registered after 2001 was affected by substantial increasing of deficit current account, because of pronounced rising of goods and services imports level, comparatively with the exports one.

The economic growth after the year 2004, considered as the highest for Romania after 1989, was realised principally due to a good agricultural

year and to constructions, with an increasing of 22% for agriculture and 9% for constructions.

The year 2007 marks a break into the economic cycle: the inflation has come back, its trend being descending (Figure 2), the average exchange rate RON/EURO followed an ascending trend, on the base of increasing of external deficit. The economic growth was obtained principally from raising the imports much over the exports level.

After year 2009, together with significant contraction of economic growth and rising of unemployment, the national currency (“leul”) has entered under the pressure, the credit debts risen unexpectedly, and the credit level reduced considerably, on the background of risk aversion and of limited financing banks resources.

As we know, for the year 2010, International Monetary Fund has revised into down the prognosis of economic growth of Romania, from 0.8%, to zero economic growth, because of decreasing from constructions and trade.

Also, Barclays Capital, the investment division of one of greatest banks from Great Britain, sustains that Romania economy will pass through a recessiune of W type, according to industrial, trade and constructions production data. For the year 2010, the analysts from Barclays estimate an economic growth rate around 1%. The Pearson’s correlation is used within the interpretation in square for assuring the fact that its value will be between 0 and 1. 0 is for no correlation, 1 is for a perfect correlation. Adjusted Square is used for analysing the collinearity among the data.

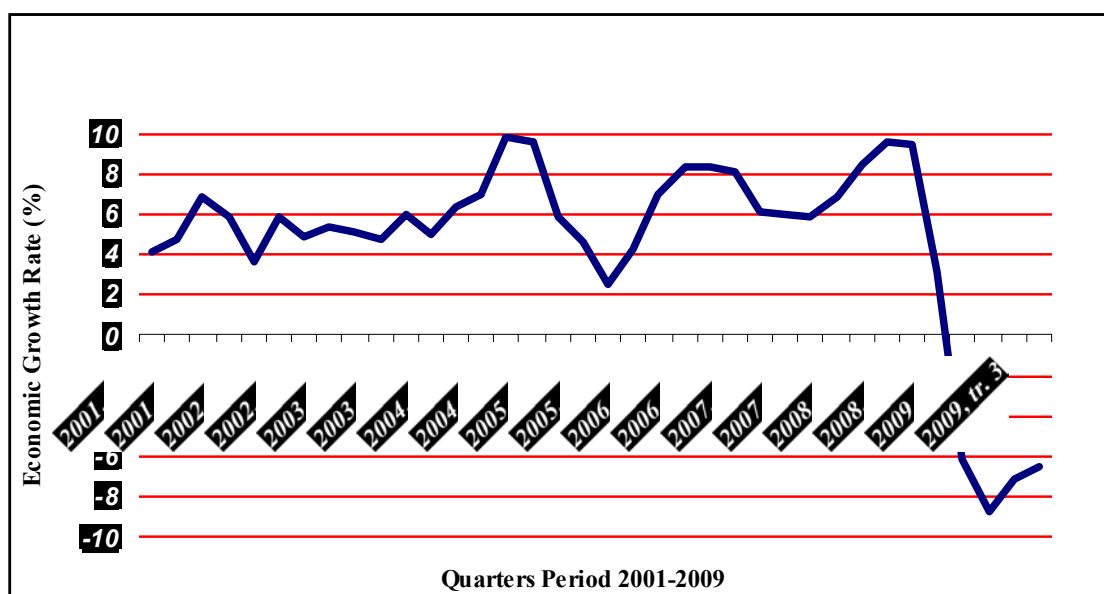


Fig. 1. Economic Growth Rate in Romania, Quarterly Evolution 2001–2009.

As we can notice in the Figure 2, on the period 2001-2007, the inflation rate in Romania registered a decreasing tendency from 40.07% at the end of trim. I of 2001, to 3.79% at the end of trim. II of 2007, followed then by an increasing from 4.99% starting with trim. III of 2007, to 8.56% at the end of 2008, and then again a decreasing to 4.56% at the end of trim. IV of 2009.

Encouraging effects for decreasing the inflation at the level of 2009 were exercised by persistent deficit of demand, and the dynamics of exchange rate of RON. These were in a great measure attenuated by unfavourable influence of demands factors, dominant being the impact of rising the accises for tobacco products.

The adverse effect of slowing down of economic activity, the rising of inflation and depreciation of national currency lead to diminution of credit demand and to come-down of quality debts portfolio owned by credit institutions to non-banking clients.

Still by launching of economic-financial crisis at international level till now, in Romania, the number of debts registered to payment of credits was to a constantly increase. This fact is due to economic situation of our country – lot of companies have reduced their activity, others have disappeared. Banks intended to limit credit approach, on the one hand because of impact area of crisis (neither mother-banks or branches from other states were not kept off by its effect) and on

the other hand, to insure that the future clients will afford the payment of instalments. The credit costs have started to decrease, influenced by the monetary policy interest of NBR of which rate was reduced starting with May of 2009, but the eligibility conditions of credit institutions became more harder to accomplish by the clients.

Using this data, applying the linear regression within SPSS 17.0 involves, on the one hand, a statistical analysis of the correlation between the dependent and independent variables and, on the other hand, the aim is to obtain the coefficients needed for the regression's equation.

The correlation analysis among the data can be done both separately, the correlations between a dependent variable and a series of independent variables, chosen from the group of all the independent variables, being analysed through the correlation coefficient, or can be done globally.

As for the correlation analysis regarding the economic growth rate as a dependent variable and the independent variables: trimestrial data for the total credit value, rate exchange RON/EURO and inflation rate, the results are presented in the Table 1. The table is structured into three parts for the correlation analysis being interesting the data obtained for the Pearson's coefficients and the significance.

In the Table 3 are presented the basic regression's indicators and in the Table 4, the coefficients for the linear regression model.

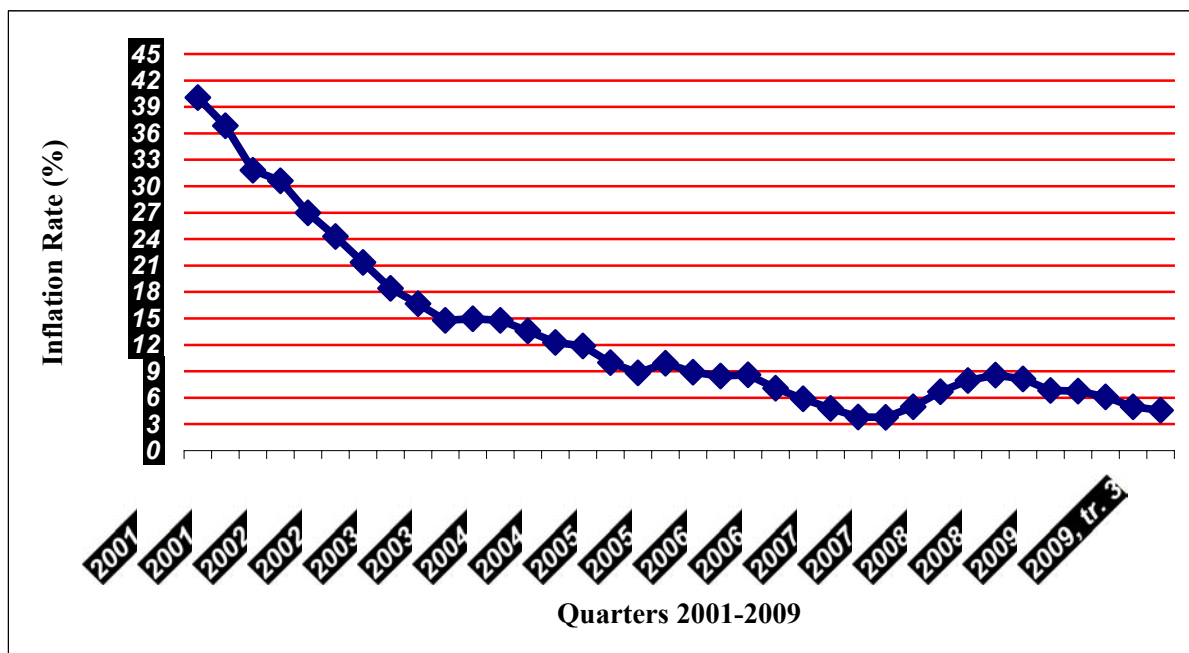


Fig. 2. Inflation Rate in Romania, Quarterly Evolution 2001-2009.

In the figure 3 is presented the histogram for the dependent variable. A histogram is a graphical representation of data frequency. In addition to this representation, the normal distribution line is also put above the histogram. Finally, the P-P residual's graph is generated (Figure 4) for concluding if the regression method is suitable or not.

RESULTS AND DISSCUSIONS

The Pearson's correlation coefficients are between -1 and 1, the positive values indicates a direct correlation, while a negative value indicates an inverse correlation.

The correlation coefficient (Pearson) indicates a stronger correlation as its value is approaching the 1 value. Furthermore, the significance has to be lower than 0.05 to express a good accuracy.

Analysing the results from the Table 1, for all the 36 observations, the correlation coefficients have negative values, thus there are opposite correlations between the dependent and independent variables (when one variable grows, the others decrease).

The linear regression: a relationship between the economic growth rate and the others indicators

The linear regression is based on the calculation of the correlation coefficient for the all the variables group, the correlation between a dependent variable and the others independent

variables being analysed. If the correlation coefficient has a value approaching 1, this means that the correlation is strong.

The aim of using the linear regression is to determine what impact on the economic growth has the independent variables such as:

- a) Total credit bil RON;
- b) Average rate exchange RON/EUR;
- c) Inflation Rate.

The optimal method used for the linear regression model is the backward method, which is based on the elimination, at every step of iteration, of the independent variable which has the weakest influence on the dependent variable.

None of the independent variables were removed, as it is shown in Table 2.

From the Table 3, there can be observed that among the variables, it is a good correlation, but not very strong, because the correlation coefficient is 0.681. In addition to this value, none of the independent variables have been removed, so all these variables have a semnificative influence on economic growth.

The significance is below 0.05, which means that there are small errors determined by chance.

As a remark, the total credit influence on the economic growth is very good and strong (sig.=.000), and the tolerance is 0.618, greater than 1-Adjusted R square (1-0.414=0.586), which eliminates the uncollinearity risk. VIF (Variance Inflation Factor = 1/Tolerance) also helps for the collinearity analysis, being able to warn about an uncollinearity situation if its value has a greater value than 6.

Table 1

The correlation coefficients and the significance for the dependent and independent variables

		Correlations			
		Economic growth	Average rate exchange RON/EURO	Inflation rate	Total credit value bil RON
Pearson Correlation	Economic_growth	1.000	-.360	.130	-.535
	Average_rate_exchange RON EURO	-.360	1.000	-.742	.507
	Inflation_rate	.130	-.742	1.000	-.613
	Total_credit_value_bil RON	-.535	.507	-.613	1.000
Sig. (1-tailed)	Economic_growth	.	.016	.226	.000
	Average_rate_exchange RON EURO	.016	.	.000	.001
	Inflation_rate	.226	.000	.	.000
	Total_credit_value_bil RON	.000	.001	.000	.
N	Economic_growth	36	36	36	36
	Average_rate_exchange RON EURO	36	36	36	36
	Inflation_rate	36	36	36	36
	Total_credit_value_bil RON	36	36	36	36

Table 2

The backward method

Variables Entered/Removed^b

Model	Variables Entered	Variables Removed	Method
1	Total_credit_value_bil RON, Average_rate_exchange RON EURO, Inflation_rate ^a		Enter

^a All requested variables entered.^b Dependent Variable: Economic_growth

Table 3

The correlation coefficient

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.681 ^a	.464	.414	3.554218

^a Predictors: (Constant), Total_credit_value_bil RON, Average_rate_exchange RON EURO, Inflation_rate^b Dependent Variable: Economic_growth

Table 4

The linear regression coefficients

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	29.850	7.649		3.903	.000		
Average_rate_exchange RON EURO	-4.925	1.881	-.508	-2.619	.013	.445	2.250
Inflation_rate	-.322	.102	-.669	-3.160	.003	.373	2.679
Total_credit_value_bil RON	-3.969E-5	.000	-.688	-4.177	.000	.618	1.617

^a Dependent Variable: Economic_growth

In our case, VIF is 1.617, which also eliminates the uncollinearity risk.

Thus, using the coefficients calculated (column B – Table 4), **the linear regression equation obtained is:**

$$\begin{aligned} \text{Economic Growth Rate} = & -4.925 \text{ Average Rate} \\ & \text{Exchange} - 0.322 \times \text{Inflation Rate} - \\ & - 3.96 \times 10^{-5} \times \text{Total Credit Value} + 29.85 \end{aligned} \quad (1)$$

The histogram obtained is:

Histogram

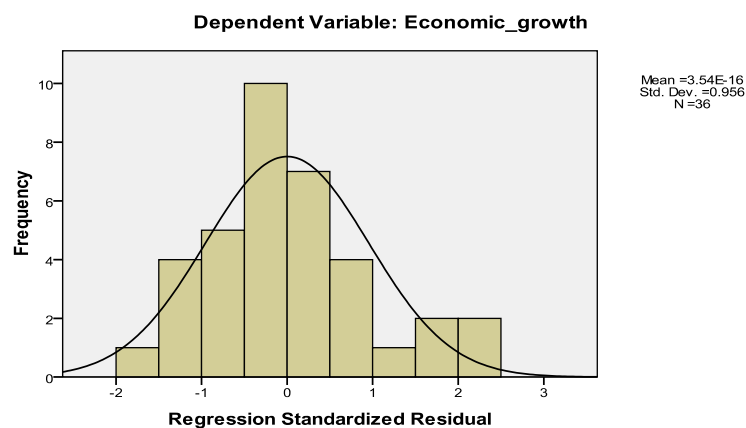


Fig. 3. Histogram.

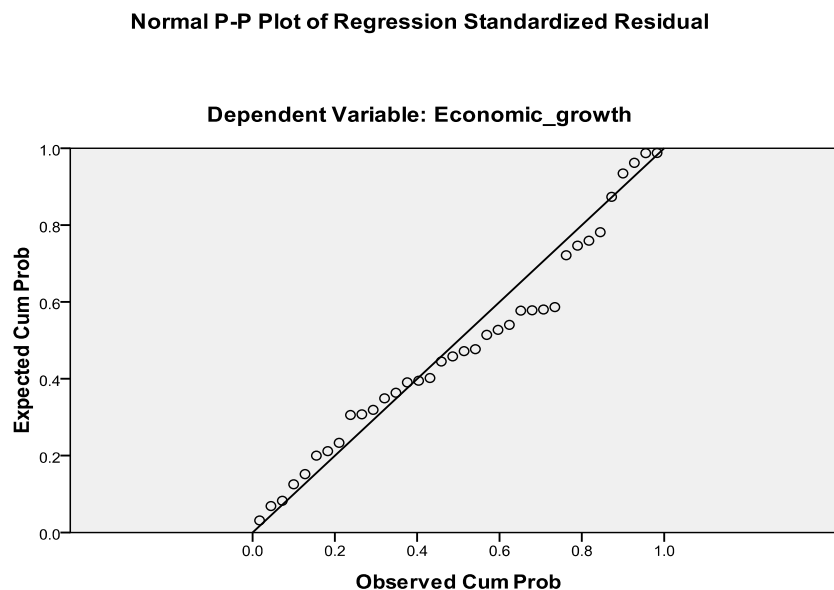


Fig. 4. P-P standard residuals graph.

In Figure 3 and Figure 4 were represented the residuals by comparing them with the normal distribution law. A residual is an observable *estimate* of the unobservable statistical error. The residuals generally comply with the normal distribution law (an empirical analysis based on the comparison of the curve – Figure 3 and of the points near the line – Figure 4), thus the linear regression model can be applied for the data analysed. As an observation, for the 0.6-0.9 interval the residuals don't comply with the normal distribution law, so on this interval the errors can be higher.

CONCLUSIONS

The interpretation of coefficients from regression equation points out that, considering data for the period 2001–2009, on a short period of time, it is expressed the following correlations:

- if average exchange rate increases with one point, then economic growth rate decreases with 4.9 percent;
- if inflation rate increases with one percent, then economic growth rate decreases with 0.322 percent;
- if total credit value increases with 1 million RON, then economic growth rate decreases with 3.96×10^{-5} percent.

Therefore, the answer to the question "what is the direction of the causality relation between economic growth and credit market development?" in Romania is that the growth of private credit,

inflation rate and average rate exchange rate do not encourage the economic growth, leading to a relative decline in the economic growth rates.

This conclusion is the same with that obtained by Koivu in 2002 when he analysed the relationship between credit market and economic growth in 25 countries in transition, including Romania, and he invalidated previous theories which sustained the direct causality relation between credit market and economic growth.

Consequently, on the short time, credit activity, inflation rate and the evolution of average exchange rate in Romania have to be under control in order do not influence in the negative way economic growth in our country.

Extending the macroeconomic unbalances: consolidated budget deficit and current account deficit of payment balance – make hard to sustain the dynamics of GDP, especially into a world-wide environment characterized by uncertainty and prudence.

This is explained by that, also the deficit is in figures, the perspective problems are that what are related of low income at the budget, on the background of some expenses inadequate managed, orientation the credits towards consumption and less to productive investments, on the background of crisis deeply manifested into Romania, too.

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