

## EMPIRICAL STUDY REGARDING THE RELATION BETWEEN THE ROMANIAN BANKING SYSTEM AND ECONOMIC GROWTH

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### 1. General considerations

Analysing the current economical context, we may notice that this difficult period is a challenge to financial stability in Romania. World economy could be affected by a reduction in the growth rate, especially at the level of developed economies. Translating the negative effects by contagion, effects caused by the crisis of sovereign debts in some EU countries and in the USA and maintaining the vulnerabilities in certain European banking sectors may have repercussions on the economic growth in Romania, on the capacity of the banking sector to access funds and on the quality of bank assets.

### 2. Research methodology

We wonder what actions were taken by the National Bank of Romania to minimise as much as possible the possible negative effects caused by contagion on the mentioned channels. The answer is simple, because NBR closely and permanently monitors the prudential situation of banks – Romanian legal entities with foreign capital from the countries affected by the crisis of

sovereign debts. The capacity of these banks to cope with a potential shock of external financing was consolidated in 2011, the solvability level being for most of the banks in this group at values higher than the average by system, and the liquidity one at similar values, above the regulated level. Moreover, the financial contribution of the parent-banks and after the outbreak of the crisis, they ensured over 95 percent of the external financing attracted in 2010 by their Romanian subsidiaries.

In the analysis performed, we started from the model suggested by Mankiw and others. (1992) (equation 1) and that had already been applied for the financial system of India by Chakraborty Indrani, (2008, 2010), as follows:

$$Y_t = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta} \quad (1)$$

where  $Y_t$  is the production,  $K_t$  is the capital,  $H_t$  is the human capital stock,  $L_t$  is the labour and  $A_t$  is the technology level. We shall apply the same model for our country too. By applying the logarithm on both sides and replacing  $A_t = A_0 e^{kt}$ , we get:

$$\log Y_t = \alpha \log K_t + \beta \log H_t + (1 - \alpha - \beta) \log A_0 + kt + (1 - \alpha - \beta) \log L_t \quad (2)$$

Here, we make a simplifying assumption (Chakraborty, I., 2010) that  $k$ , the progress of knowledge, remains constant over time.

It is further assumed that  $\log A_0 = \gamma + \varepsilon_t$ . Thus, from the equation (2), we have:

$$\log Y_t = \alpha \log K_t + \beta \log H_t + \gamma + \varepsilon_t + kt + (1 - \alpha - \beta) \log L_t \quad (3)$$

By differentiating the equation(3), depending on  $t$ , we get the equation (4):

$$g = \alpha(1/K)dK/dt + \beta(1/H)dH/dt + (1 - \alpha - \beta)(1/L)dL/dt + k + u_t \quad (4)$$

where  $g$  is the production growth rate. It is assumed that the gross investments have the following form (Chakraborty, I., 2010) (equation [5]):

$$I_t = K_{t+1} - (1 - \delta)K_t \quad (5)$$

where  $I_t$  = gross investments and  $\delta$  = the rate which the capital depreciates at during a period. In a free economy, where the budget is balanced, the lag between economies and investments is equal to the commercial deficit (equation [6]).

Thus, (Chakraborty, I., 2010):

$$S_t - I_t \equiv X_t - M_t \equiv -K_{ft} \quad (6)$$

where  $S_t$  = the internal gross economies during the period  $t$ ,  $X_t$  = exports during the period  $t$ ,  $M_t$  = imports during the period  $t$  and  $K_{ft}$  = net capital inflows. Assuming that during the financial intermediation process, some leakages occur  $(1 - \theta)$  outside the flow of internal economies, we can write:

$$\theta S_t + K_{ft} = I_t \quad (7)$$

By replacing the equations (5) and (7) in (4), we can get (Chakraborty, I., 2010):

$$g = \alpha(((\theta s + \varphi)/(K_t/Y_t)) - \delta) + \beta(1/H) dH/dt + (1 - \alpha - \beta)(1/L)dL/dt + k + u_t \quad (8)$$

where  $s = S_t/Y_t$  și  $\varphi = K_{ft}/Y_t$ .

The equation (8) suggests that in the steady state (Chakraborty, I., 2010), the growth rate depends on the ratio between the capital and production, the proportion of total economies that are transformed into a ratio between investments and economies, the ratio net capital inflows and aggregated production or incomes, the depreciation rate, human capital growth rate and labour force growth rate.

We could also consider the behavioural nature (Chakraborty, I., 2010) of each element in the equation (8).

For the variable  $\theta$ , it is reasonable to assume that its behaviour depends on any of the two indicators of developing the stock exchange and namely the market capitalisation (MCAP) and turnover (TURN). The coefficient of market stock capitalisation is generally considered as a measurement of the stock exchange size, and the turnover measures the liquidity of the stock exchange.

Therefore, we assume further that  $\theta$  depends on the real effective exchange rate (REER). In a study performed by Greene and Villanueva (1991) on a sample of 23 developing countries, it has been observed that the high rate of inflation had a negative effect on private investments. Thus, the inflation (INFL) also becomes an influencing variable to explain the behaviour of  $\theta$ . The behaviour of  $\theta$  can therefore be expressed as follows [9]:

$$\theta = f(STOCK, REER, INFL) \quad (9)$$

where  $STOCK$  = stock exchange development indicator.

Following the reasoning of Murinde (1996), the behaviour of the coefficient of economies ( $s$ ) is considered to be influenced by the profitability rate on the monetary market or the market interest rate (INT). It is also likely that the coefficient of Romanian economies also depends on the profitability rate on the unofficial market of credits. However, it is difficult to measure the profitability rate on the unofficial market of credits. On the other hand, according to Chakraborty (2010), Indian private economies are additionally influenced by inflation (INFL), actual wealth (WEALTH), estimated by

the ratio between the money supply (M3) and the gross national income (Athukorala and Sen 2004). Therefore, the behaviour of  $s$  in India can be expressed as follows:

$$s = f(INF, INFL, WALTH) \quad (10)$$

For simplicity, we assume that  $g$ , the production growth rate is linearly related to each variable in the previous specifications. By replacing the functions from the equations (9) and (10) into (8), we get the reduced form below:

$$g = \alpha_0 + \alpha_1(K/Y) + \alpha_2STOCK + \alpha_3INT + \alpha_4REER + \alpha_5INFL + \alpha_6WEALTH + \alpha_7\varphi + \alpha_8RHUM + \alpha_9RLAB + \nu \quad (11)$$

where  $\nu$  = the white noise error term,  
 $RHUM = (1/H)dH/dt$   
 $RLAB = (1/L)dL/dt$  and  $STOCK$  can be  $MCAP$  or  $TURN$ .

*Reports of the National Bank of Romania, International Financial Statistics* (International Monetary Fund), Bucharest Stock Exchange, EUROSTAT, UNCTAD.

The equation (11) (Chakraborty, I., 2010). shows how the development of the banking system and stock exchange growth could affect the growth after investigating the effects of a large number of macroeconomic variables, along with the human capital growth rate and the labour force growth rate.

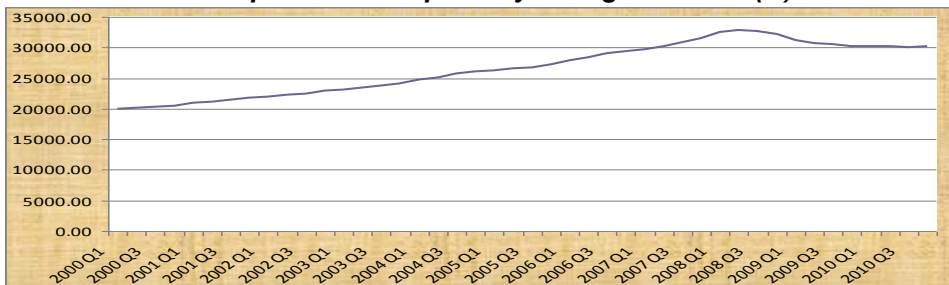
The growth rate of GDP (G) is measured as the growth rate of the gross domestic product. The data series concerning the GDP are the quarterly ratio for the period in 2000 until 2010 by the National Institute of Statistics.

### 3. Results of the analysis

The empirical analysis is done by means of the quarterly data for Romania, for the period 2000 - 2010. The data series have been acquired or compiled from the *Statistical Yearbooks, Annual*

According to the data in the *Statistical Yearbook of Romania*, after a period of decline (1997-2001) of the Gross Domestic Product, the economic growth was revived since 2002 and was significantly determined by the increase of the workload in the field of services, constructions and industry.

**Graph no.1. The quarterly GDP growth rate (G)**



The economic growth registered after 2001 was affected by the substantial increase of the current account deficit, due to the higher increase of the volume of imports of goods and services, compared to that of exports.

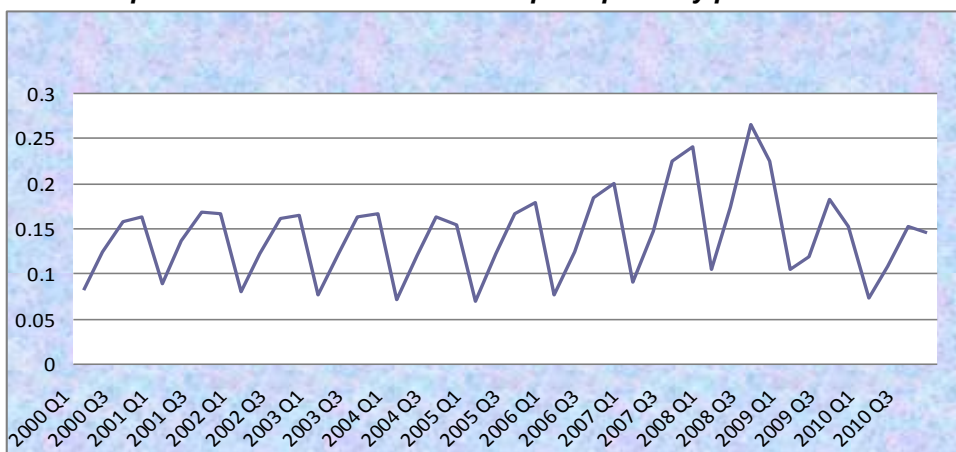
The economic growth registered in 2004, considered as the best one of Romania after 1989, has mainly been achieved based on a good agricultural year and on constructions.

2007 marks a break in the economic cycle: inflation returned, its trend being descendant (graph no. 5),

and the Leu/Euro exchange rate followed an ascending tendency, based on the external deficit growth. The economic growth was mainly obtained based on the increase of imports far above the value of exports.

After 2009, along with the significant contraction of the economic activity and unemployment increase, the Leu has come under pressure, the overdue loans rose suddenly, and the advance of lending slowed down considerably, due to the risk aversion and banks' limited financial resources.

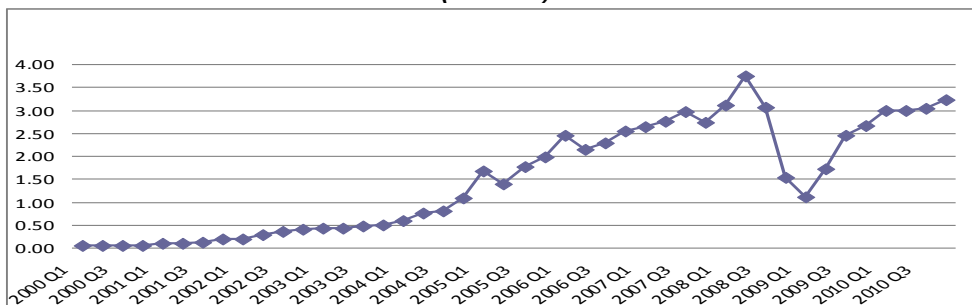
**Graph no.2. The evolution of the capital/quarterly production ratio**



To assess the ratio between the capital and production, we used the data regarding the gross formation of capital and production of goods and services, by using the numbers from the data series of the database of INSSE TEMPO Online.

The development of the stock exchange (STOCK) can be measured either by market capitalisation (MCAP), or by the turnover (TURN). We have used the data regarding the market capitalisation which we expressed as percentage of GDP.

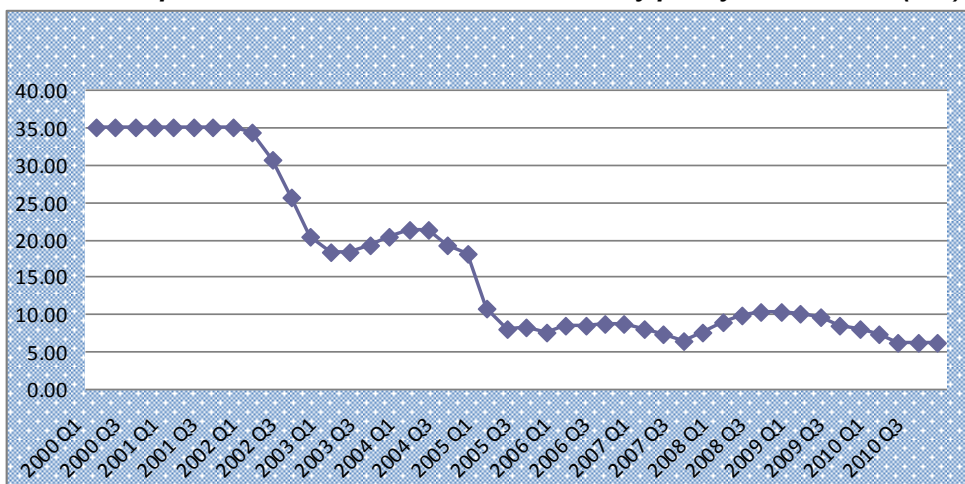
**Graph no.3. The evolution of market capitalisation as percentage of GDP (STOCK)**



The data regarding the interest rate (INT) are those in the database of the National Bank of Romania

concerning the monetary policy interest rate.

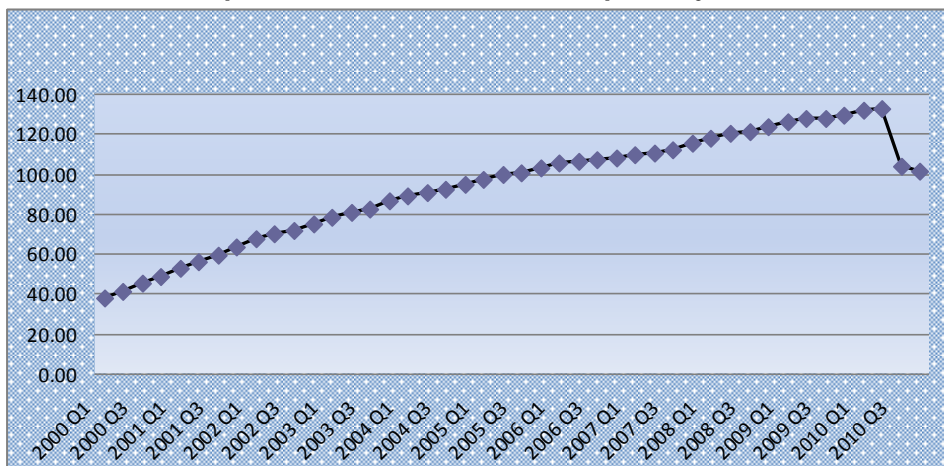
**Graph no.4. The evolution of the monetary policy interest rate (INT)**



The inflation is measured as annual average (graph no.5.);  $\varphi$  is assessed as net capital inflows to the

GDP, meaning the share of foreign investments directly into the GDP based on the data of UNCTAD.

**Graph no.5. The evolution of the quarterly inflation rate**

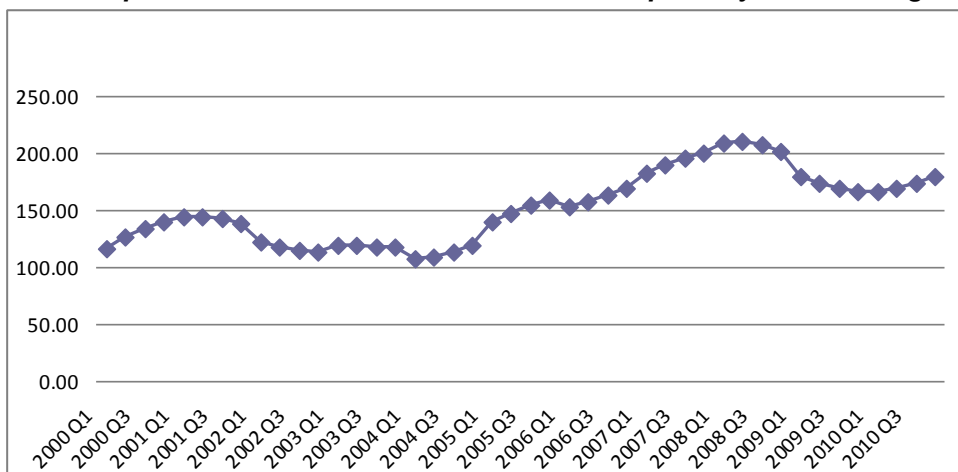


We assessed the real effective exchange rate (REER) based on the real effective exchange rate, according to the data provided by EUROSTAT (graph no. 6.).

an indicator calculated as share in the same age group, based on the data provided by the National Institute of Statistics.

To assess the human capital, we considered the level which includes in education the population aged over 19,

For the variable regarding the labour force growth, we have used the data on the employment rate.

**Graph no. 6. The evolution of the effective – quarterly real exchange rate**

To understand this more easily, we shall present a recapitulative table on the definitions of variables, symbols used

and measurements performed (see Table no.1).

**Table no. 1. Summary table of the variables used in the model**

Definition of variable	Symbol used	Measurement of variable
GDP growth rate	<b>G</b>	Growth rate of the gross domestic product
Interest rate	<b>INT</b>	Monetary policy interest rate
Inflation	<b>INFL</b>	Annual inflation rate
Net capital inflows into GDP	$\phi$	Share of foreign direct investments in GDP
Real effective exchange rate	<b>REER</b>	The real effective exchange rate determined based on exports
Human capital growth rate	<b>RHUM</b>	Level including in education the population aged over 19
Labour force growth rate	<b>RLAB</b>	Employment rate
Wealth measurement	<b>WEALTH</b>	Ratio between M3 and the gross national income
Stock exchange development indicator	<b>STOCK</b>	Ratio between market capitalisation and GDP
Gross formation of capital related to the production achieved	<b>K/Y</b>	Ratio between capital and production

We shall further investigate empirically the extent to which these factors explain the economic growth in the current Romanian economic context. In order to reduce the differences between

the various values of the variables and for the accuracy of the results, we shall previously render the data logarithmic, which we shall use by means of the statistical software Eviews.

To start with, the Johansen cointegration test is applied to a version of first-order vector auto-regression of equation (11), in order to investigate the presence of cointegration among the GDP growth rate, the ratio between the capital and production, stock exchange development indicator, interest rate on the monetary market, real effective

exchange rate, deferred value of the debt burden, inflation, wealth, net capital inflows as coefficient of GDP, the labour force growth rate and human capital growth rate. The lag duration of the VAR model is selected based on the information criteria Akaike and Schwarz (table 2).

**Table no. 2. The Johansen cointegration test**

Date: 10/29/12 Time: 00:36

Sample (adjusted): 2000Q3 2010Q4

Included observations: 42 after adjustments

Trend assumption: Linear deterministic trend

Series: G KY LFI LINFL LINT LREER1 LRHUM LRLAB STOCK WEALTH

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.912653	414.1584	239.2354	0.0000
At most 1 *	0.800098	311.7680	197.3709	0.0000
At most 2 *	0.754482	244.1510	159.5297	0.0000
At most 3 *	0.694458	185.1668	125.6154	0.0000
At most 4 *	0.568236	135.3688	95.75366	0.0000
At most 5 *	0.461885	100.0940	69.81889	0.0000
At most 6 *	0.448643	74.06730	47.85613	0.0000
At most 7 *	0.399844	49.06166	29.79707	0.0001
At most 8 *	0.344132	27.61791	15.49471	0.0005
At most 9 *	0.210041	9.902494	3.841466	0.0016

Trace test indicates 10 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.912653	102.3904	64.50472	0.0000
At most 1 *	0.800098	67.61706	58.43354	0.0050
At most 2 *	0.754482	58.98415	52.36261	0.0092
At most 3 *	0.694458	49.79799	46.23142	0.0200
At most 4	0.568236	35.27480	40.07757	0.1576
At most 5	0.461885	26.02672	33.87687	0.3191
At most 6	0.448643	25.00563	27.58434	0.1032
At most 7 *	0.399844	21.44375	21.13162	0.0452
At most 8 *	0.344132	17.71542	14.26460	0.0137
At most 9 *	0.210041	9.902494	3.841466	0.0016

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Source: own calculations in Eviews

The maximum own value and statistical test “trace” in Table no.2. suggest that there are at least 4 cointegration vectors between the 10 variables taken into account in equation (11). As outlined by Maysami and Koh (2000), when there is more than one cointegration vector, the first own vector, which is based on the greatest own value, is deemed to be the most useful. Therefore, we shall discuss the results of the first cointegration vector in detail and shall ignore the discussions concerning

other cointegration vectors. The observations of the first cointegration vector suggest that there is a stable relationship of long term balance between the real increasing rate, the financial development indicators, other macroeconomic bases, the labour force growth rate and the human capital growth rate in Romania.

The first and most useful one of the five possible cointegration vectors may be interpreted as the **long term growth equation** (12):

$$\begin{aligned}
 G = & -226.78K/Y - 105.83RLAB - 14.52RHUM \\
 & + 4.91\phi \\
 & - 12.66STOCK - 4.40INT + 36.84REER - 16.02INFL \\
 & + 190.00WEALTH
 \end{aligned}
 \tag{12}$$

**Normalized cointegrating coefficients (standard error in parentheses)**

G	KY	LFI	LINFL	LINT	LREER1	LRHUM	LRLAB	STOCK	WEALTH
1.000000	-226.7861	4.910396	-16.02469	-4.403523	36.84918	-14.52753	-105.8306	-12.66006	190.0091

From the long term growth equation, it appears that the ratio between the capital and production and the labour force growth rate have a negative effect on the economic growth, and the human capital growth rate also has a negative effect on the economic growth. In this case, the negative effect of the human capital on the economic growth seems not to meet our hypothesis to explain the economic growth by means of the model of Mankiw and others. (1992). A growth of the net capital inflows as percentage of GDP boosts the economic growth during the analysed period. This result seems to be due to the nature of the capital in Romania in recent years. Thus, our observation suggests that this special type of capital flow contributes in developing the real sector of economy. The market capitalisation has a negative effect on the economic growth. Therefore, we may generally say that the growth of the stock exchange did not influence the economic growth in Romania during the analysed period.

economic growth. This implies that a decrease of the interest rate, which shows the effect of the actions taken by the NBR within the banking system, has improved the real GDP growth rate during the analysed period. The WEALTH variable has a positive effect on the economic growth. In Romania, it seems that a growth of the real wealth has a positive effect on the saving rate by which the actual rate of economic growth is also affected positively. Finally, inflation has a negative effect on the economic growth. Thus, the increase of the inflation rate does not encourage the economic growth, leading to a relative decline in the economic growth rate.

#### 4. Conclusions

This paper has analysed the impact of the financial sector growths on the economic growth in Romania during 2000-2010. First of all, the model of Mankiw and others. (1992) already applied by Chakraborty (2008, 2010) has been extended in order to establish the relation between the financial

On the other hand, the market interest rate has a negative effect on the



development and economic growth. The model has been assessed afterwards by using the quarterly data for the period 2000 – 2010 in Romania, using the cointegration techniques and the method of the error correction vector.

The result of cointegration shows that the ratio between capital and production and the human capital growth rate have a negative impact on the real rate of GDP growth. An increase of the market capitalisation seems to have a negative effect on the economic growth in Romania.

On the other hand, the effects of the interest rate on the monetary market has a negative effect on the economic growth, which shows that the effect of the actions taken by NBR within the banking system has improved the growth rate of real GDP during the analysed period. An interesting observation is that direct foreign investments as share of the GDP have a positive effect on the economic growth.

Therefore, the observations do not provide any support to the theoretic prediction that the development of the stock exchange would play an important role in intensifying the economic growth in Romania. In contrast with the stock exchange development, the actions taken by NBR on maintaining a monetary policy interest rate at a lower level seems to have significantly promoted the economic growth, as well as the ratio between the money supply M3 and the Net National Income. The results support the view that the stock exchange development may not accelerate the process of economic growth in developing countries (Singh 1997). These results suggest that in Romania, the stock exchanges are not substitutes for the banking system and that one of the factors that can further put their mark on the acceleration of economic growth in our country is the banking system.

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