EMPIRICAL STUDY REGARDING THE INFLUENCE OF THE GDP AND INTEREST RATE ON THE NON-GOVERNMENT CREDIT. STUDY CASE FOR ROMANIA

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Abstract: Despite the stimulating effect of measures taken by the central bank, we notice the tendency of stagnation of non-government credit, started in the fourth quarter of 2008. Delayed economic recovery, credit costs still high and the manifestation of a more cautious attitude of banks, and customers, indicated the maintaining of current trends for the year 2011. Therefore, in this paper, we proposed ourselves to analyze the influence of the GDP and interest rate on the non-government credit using the regression function. We will then establish the correlations between these indicators, emphasize the changes that appeared over the years and the measures to be taken in order to improve the loan portfolio quality in the Romanian banking system.

1. INTRODUCTION

According to the data reported by the National Bank of Romania[1] (NBR), lending showed feeble revival signs in the last period given the persistent uncertainties surrounding economic developments. Banks have further pursued a prudent pro-cyclical stance in granting new loans and opted for loan refinancing and purchases of government securities, despite the measures taken by the central bank in order to bring interest rates to normal levels and foster the resumption of lending.

2. OBJECTIVES

Before we begin our research on the influence of the Gross Domestic Product (GDP) and interest rate on the non-government credit using the regression function we should first make assessments on the evolution of the non-government credit in our country.

Therefore, according to the data collected from the National Bank of Romania, the future developments in non-performing loans and the challenges posed by foreign currency loans granted to unhedged borrowers further rank among the top issues on the agenda of the central bank in the short run. The significant loan provisioning led to an increase in reserves for covering expected losses. The prevention of risks generated by foreign currency loans to unhedged borrowers needs a coherent European approach,

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[1] National Bank of Romania – *Financial Stability Report 2011,* Chapter 3, Financial System and its Related Risks, pp. 38.

along with the adoption of new measures at national level in order to improve bank risk management, the transparent translation of risks from loans to unhedged borrowers (households in particular) into costs of related financial products and the balancing of flows of new loans denominated in domestic and foreign currency. Loan portfolio quality is expected to improve in line with the favourable domestic macroeconomic developments.

In 2010, bank assets and non-government loans saw a marginal increase in nominal terms, which was the equivalent of a small reduction in real terms, given that the economic growth rate stayed in negative territory. The dynamics of net bank assets remained low (3.5 percent in nominal terms in 2010 according to the NBR' Financial Stability Report) as compared with the previous year's figure of 5 percent. In spite of the measures adopted by the central bank with a view to ensuring monetary conditions for fostering private sector's demand for loans, banks further showed stronger pro-cyclical risk aversion, by opting for loan refinancing and purchases of government securities, on the back of considerable issues for budget deficit financing. As a result, non-government loans posted an annual growth of merely 4.7 percent in nominal terms in 2010.

However, despite the changes seen in banks' 2010 balance sheets (the slow pace of lending, the provisioning of a significant share of loan portfolio and the marginal increase in deposits of non-bank clients), the share to GDP of bank assets stayed put at 67 percent. Romania ranks further among the countries with financial market depth lower than that of other Member States.

In addition, lending standards applicable to companies and households were kept relatively unchanged, being slightly loose in the case of real estate loans, while lending terms saw a marginal loosening in 2010. On the demand side, non-government loans were depressed by[2]:

i) the contraction in household income following the measures taken for the purpose of fiscal consolidation, as well as the lingering uncertainties surrounding the level of such income in the period ahead;

ii) the increased prudence in liquidity management which resulted in lower consumption and higher propensity for saving by way of either time deposits or purchases of government securities.

We notice that according to NBR' statistical data, despite the measures adopted to gradually cut policy rate, the real developments in non-government loans (considering the end of 2008 Q3 as the reference date when the fallout from the global economic crisis first hit the Romanian financial system) reveal the stronger decline of this indicator in April 2009 – April 2011 to -11 percent, on the back of its domestic currency component. Starting May 2011, lending showed an improved performance, which materialised in the slower contraction of non-government loans to -6.8 percent in June 2011, according to NBR data. This may be largely attributed to the rise in foreign currency loans (4.6 percent in June 2011[3], including the effect of exchange rate movements).

However, the private consumption (the main component of GDP) indicators still expresses an unfavorable climate. Private consumption suffered a forced landing in

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[2] National Bank of Romania – *Financial Stability Report 2011,* Chapter 3, Financial System and its Related Risks, pp. 39.
[3] National Bank of Romania – *Financial Stability Report 2011,* Chapter 3, Financial System and its Related Risks, pp. 40.

the context of the first wave of crisis. Since the growth rates of 2 percent in the years preceding the onset of economic and financial crisis, private consumption contracted during 3 consecutive years: retail sales were down 10% year / in 2009, 5.6% year / in 2010 and 5.1% year / in January-August 2011[4].

The prospects for continued private consumption adjustment process in the future are supported by a number of factors. The economy will continue to grow below potential, so conditions in the labor market will not improve (will not reduce unemployment, and wages will not increase). And the real purchasing power of pensions is reduced by inflation.

3. METHODOLOGY

The paper focuses on quantifying the effects of Romania's macroeconomic performance over the volume of loan portfolio of the banking sector.

More specifically, the paper seeks to discover those interrelated macroeconomic factors (such as interest rate, GDP) that influence the development of the loan portfolio for commercial banks. To achieve these correlations we use the regression function.

The regression equation[5] is an algebraic representation of the regression line and is used to describe the relationship between the response and predictor variables. The regression equation takes the form of:

Response = constant + coefficient(predictor) + ... + coefficient(predictor)

or $y = b_0 + b_1X_1 + b_2X_2 + ... + b_kX_k$

Where:

- Response (Y) is the value of the response.

- Constant (b_0) is the value of the response variable when the predictor variable(s) is zero. The constant is also called the intercept because it determines where the regression line intercepts (meets) the Y-axis.

- Predictor(s) (X) is the value of the predictor variable(s).

- Coefficients (b_1, b_2, ... , b_3) represent the estimated change in mean response for each unit change in the predictor value. In other words, it is the change in Y that occurs when X increases by one unit.

The coefficient table lists the estimated coefficients for the predictors. Linear regression examines the relationship between a response and predictor(s) . In order to determine whether or not the observed relationship between the response and predictors is statistically significant, we need to:

- *Identify the coefficient p-values:* The coefficient value for P (p-value) tells whether or not the association between the response and predictor(s) is statistically significant .

- *Compare the coefficient p-values to the α-level:* If the p-value is smaller than the α-level we have selected, the association is statistically significantly. A commonly used α-level is 0.05.

S, R^2 and adjusted R^2 are measures of how well the model fits the data. These values can help us select the model with the best fit.

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[4] National Bank of Romania – *Financial Stability Report 2011,* Chapter 3, Financial System and its Related Risks, pp. 42.

[5] Minitab Statistical Guide based on many books in the field such as: Hosmer, D.W., Lemeshow S. - ”*Applied Logistic Regression*”, 2nd edition, John Wiley & Sons, Inc.

- *S* is measured in the units of the response variable and represents the standard distance data values fall from the regression line. For a given study, the better the equation predicts the response, the lower S is.

- *R^2 (R-Sq)* describes the amount of variation in the observed response values that is explained by the predictor(s). R^2 always increases with additional predictors. For example, the best five-predictor model will always have a higher R^2 than the best four-predictor model. Therefore, R^2 is most useful when comparing models of the same size.

- *Adjusted R^2* is a modified R^2 that has been adjusted for the number of terms in the model. If we include unnecessary terms, R^2 can be artificially high. Unlike R^2, adjusted R^2 may get smaller when we add terms to the model. We can use adjusted R^2 to compare models with different numbers of predictors.

The analysis of variance table shows the amount of variation in the response data explained by the predictors and the amount of variation left unexplained.

If repeated response values are observed at certain settings of the predictors, the unexplained variation can be divided into the variation due to pure error and the variation due to model inadequacy (lack-of-fit).

The two values under P (p-values) are the most important results to consider:

- We use the first p-value (Regression) to analyze whether the regression coefficients are significantly different from zero. If the p-value is smaller than a pre-selected α-level , we can deduce that at least one coefficient is not zero. A commonly used α-level is 0.05.

- We use the second p-value (Lack of Fit) to determine whether the linear predictors alone are sufficient to explain the variation in Response.

If the p-value is smaller than a preselected α-level, we can conclude that the linear predictors are not sufficient to explain the variation in response. In that case, we might want to consider higher order terms. We could include the quadratic terms of the predictors, one at time, and reanalyze the data.

4. ANALYSES

In order to analyze the influence of the GDP and interest rate on the non-government credit we use the quarterly data collected from the Statistical Data Warehouse of the European Central Bank for the period 2000 – 2010 (see table no. 1 and figures no. 1, 2 and 3.).

Table no. 1

Year	GDP (pib_sa)	Monetary policy rate (rd_bnr)	Non-government credit (cred_neguv)
2000Q1	20114,1	35	6139,29
2000Q2	20212,9	35	6612,48
2000Q3	20272,3	35	7021,36
2000Q4	20556,8	35	7335,51
2001Q1	21025,3	35	8174,41
2001Q2	21147,9	35	9055,46
2001Q3	21556	35	9993,51
2001Q4	21743,6	35	11227,84
2002Q1	21919,3	34,6	12533,05

2002Q2	22392,2	32,3	14358,99
2002Q3	22500,3	27,03333333	15127,05
2002Q4	22905,1	22,13333333	17201,84
2003Q1	23133	19,06666667	19069,31
2003Q2	23489,2	17,83333333	21620,32
2003Q3	23765	18,50333333	24695,45
2003Q4	24033	19,95	28622,17
2004Q1	24673,4	21,25	31717,52
2004Q2	25188,7	21,25	34155,86
2004Q3	25988,5	20,09333333	38055,88
2004Q4	26203,5	18,48666667	40635,18
2005Q1	26171	14,58333333	41409,63
2005Q2	26400,7	8,136666667	46372,97
2005Q3	26710,5	8,083333333	52003,27
2005Q4	27236,4	7,573333333	58439,03
2006Q1	28029,2	7,823333333	62366,67
2006Q2	28483,4	8,5	71416,53
2006Q3	28848	8,666666667	81402,83
2006Q4	29413,3	8,75	90483,47
2007Q1	29854,8	8,526666667	95646,93
2007Q2	30213,9	7,583333333	106045,8
2007Q3	30463,3	6,61	121939,8
2007Q4	31440,2	7,123333333	140872,6
2008Q1	32636,3	8,166666667	159071,7
2008Q2	33129,4	9,426666667	172916,2
2008Q3	32989,4	10	185498,7
2008Q4	32258,6	10,25	195426,8
2009Q1	30929,3	10,21333333	205314,3
2009Q2	30473,4	9,933333333	199229,9
2009Q3	30489,7	9,01	198500,8
2009Q4	30021,5	8,166666667	200656
2010Q1	29931,4	7,583333333	199285,3
2010Q2	30021,2	6,583333333	204747

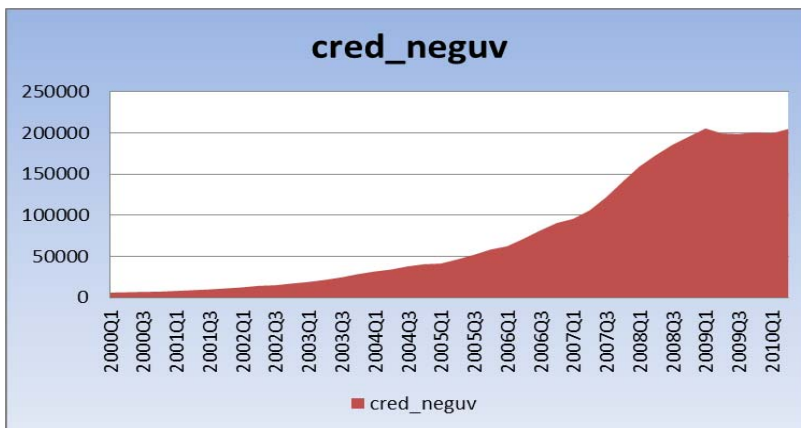*Source: www.ecb.int. - Statistical Data Warehouse*
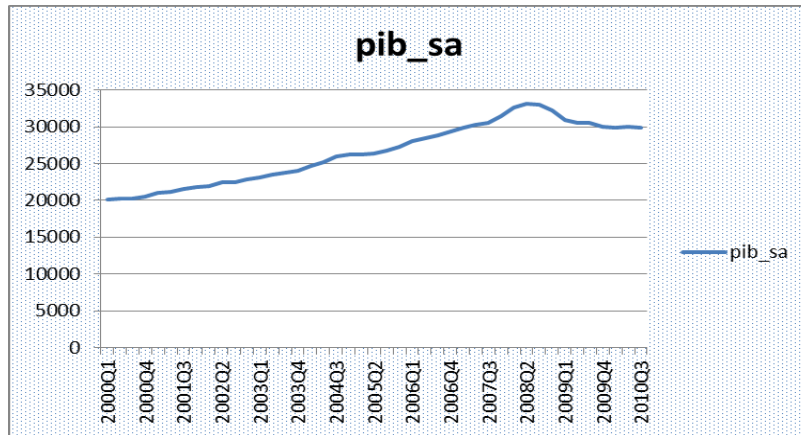
Source: own calculations based on the www.ecb.int. - Statistical Data Warehouse

Figure no. 1
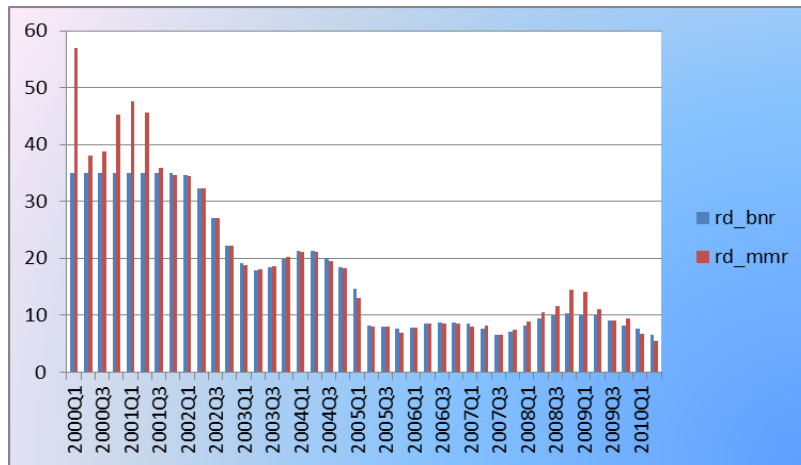
Source: own calculations based on the www.ecb.int. - Statistical Data Warehouse

Figure no. 2

Source: own calculations based on the www.ecb.int. - Statistical Data Warehouse

Figure no. 3

Based on the above data, we study the correlations between the non-government credit and the macroeconomic indicators (GDP and interest rate) analyzed in the previous paragraph, using the linear regression function in Minitab Statistical Software. Data collected (except for the interest rate) are previously logarithmed in Eviews program in order to obtain more accurate results. Therefore the new data series are the following:

Table no. 2

Year	Log GDP (pib_sa)	Monetary policy rate (rd_bnr)	Log Non-government credit (cred_neguv)
2000Q1	12,20935	35	8,72246
2000Q2	12,20249	35	8,79671
2000Q3	12,22953	35	8,85671
2000Q4	9,930947	35	8,90048
2001Q1	9,953482	35	9,00876
2001Q2	9,959296	35	9,11112
2001Q3	9,978409	35	9,20969
2001Q4	9,987075	35	9,32615
2002Q1	9,995123	34,6	9,43612
2002Q2	10,01647	32,3	9,57213
2002Q3	10,02128	27,03333333	9,62424
2002Q4	10,03911	22,13333333	9,75277
2003Q1	10,04902	19,06666667	9,85584
2003Q2	10,0643	17,83333333	9,98139
2003Q3	10,07597	18,50333333	10,11437
2003Q4	10,08718	19,95	10,26194
2004Q1	10,11348	21,25	10,36462
2004Q2	10,13415	21,25	10,43869
2004Q3	10,16541	20,09333333	10,54681
2004Q4	10,17365	18,48666667	10,61239
2005Q1	10,17241	14,58333333	10,63127
2005Q2	10,18115	8,136666667	10,74447
2005Q3	10,19281	8,083333333	10,85906
2005Q4	10,21231	7,573333333	10,97574
2006Q1	10,241	7,823333333	11,04079
2006Q2	10,25708	8,5	11,17628
2006Q3	10,2698	8,666666667	11,30717
2006Q4	10,2892	8,75	11,41292
2007Q1	10,3041	8,526666667	11,46842

2007Q2	10,31606	7,583333333	11,57163
2007Q3	10,32428	6,61	11,71128
2007Q4	10,35584	7,123333333	11,85561
2008Q1	10,39318	8,166666667	11,97711
2008Q2	10,40818	9,426666667	12,06056
2008Q3	10,40394	10	12,13080
2008Q4	10,38154	10,25	12,18294
2009Q1	10,33946	10,21333333	12,23230
2009Q2	10,32461	9,933333333	12,20221
2009Q3	10,32514	9,01	12,19855
2009Q4	10,30967	8,166666667	12,20935
2010Q1	10,30666	7,583333333	12,20249
2010Q2	10,30966	6,583333333	12,22953

Source: www.ecb.int. - Statistical Data Warehouse

Thus, in case of Romania, *the influence of the GDP on the non-government credit* can be summarized in the following results:

```
Predictor    Coef    SE Coef    T    P
Constant    15,352   3,453    4,45  0,000
log pib     -0,4514  0,3337  -1,35  0,184
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$S = 1,16780$ $R\text{-}Sq = 4,4\%$ $R\text{-}Sq(adj) = 2,0\%$

GDP changes affect the non-government credit at the rate of 4,4%. A possible statistical correlation between these elements would have the following form:

Cred_neguv = 15,4 - 0,451 pib

Between the two sizes there is an indirect correlation of low intensity. Therefore, to a decrease by a percentage of the GDP, the non-government credit increased by 0,45%. As we can see from the above results this *indirect* correlation between the GDP and the non-government credit invalidates the previous theories which sustained the direct causality relation between credit market and economic growth. Thus, the growth of the non-government credit does not encourage the economic growth, leading to a relative decline in the economic growth rates.

On the other hand, the *influence of the monetary policy rate on the non-government credit* can be summarized in the following results:

```
Predictor      Coef      SE Coef     T     P
Constant     12,4481    0,1390    89,54  0,000
rd_bnr      -0,099416  0,006705  -14,83  0,000
```

$S = 0,468542$ $R\text{-}Sq = 84,6\%$ $R\text{-}Sq(adj) = 84,2\%$

The monetary policy rate changes affect the non-government credit at the rate of 84,6%. A possible statistical correlation between these elements would have the following form:

Cred_neguv = 12,4 - 0,0994 rd_bnr

Between the two sizes there is an indirect correlation of high intensity. Therefore, to a decrease by a percentage of the monetary policy rate, the non-government credit increased by 0,09%.

Accordingly, on the short time, we believe that credit activity and the evolution of monetary policy rate in Romania have to be under control in order to not influence in the negative way the economic growth in our country.

5. CONCLUSIONS

The paper highlights the impact of moderate and extreme macroeconomic shocks on banks' loan portfolio volume. The regression analysis methodology gives us useful research results. Therefore, we have proved once again that monetary factors[6] have contributed greatly to the intensity of financial crises. Beyond these results, it is clear that the interest rate and GDP play an important role in sizing the loan portfolio in the banking system. Increasing of the interest rate and a high inflation are like early warning systems for deteriorating loan portfolio quality. Therefore, the government and banks need to take efficient measures in the field of the banking risk management because the evolution of non-government credit was adversely affected by the decline in real credit demand.

In conclusion, we aggree with the NBR' specialists that short-term perspectives on the evolution of the domestic economy worsened, increasing the likelihood of returning in the last period of contraction since 2011. It remains to be seen what will be the duration of this contraction.

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