

DEVELOPMENT OF THE INFLATION RATE RELATIVE SHARE OF NON-PERFORMING LOANS IN BANKING SYSTEM

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ABSTRACT

This article presents the evolution of the non-performing loans in the total banking assets in the period of 2009 - 2014 in Romania and trying to highlight the relationship between the Track and inflation rate and also a correlation of the evolution of the non-performing loans with the broad money during the period.

KEYWORDS: *inflation rate, M3, money supply, money velocity, non-performing loans.*

JEL CLASSIFICATION: *E510 Money Supply; Credit; Money Multipliers*

1. INTRODUCTION

Within the preamble of the exposure we have as a starting point the classical equation of the relationship between money, the speed of rotation of money and the general price level of goods and services traded volume. According to Irving Fisher - "The purchasing power of money" (1911), quantitative money equation is represented by:

$$M \cdot v = P \cdot Y, \quad (1)$$

Where: M = money supply; v = money velocity; P = the general price level; Y = volume traded goods and services.

The relationship above shows the link between money (M) circulating in the economy at a time and value of transactions in goods and services (P · Y). The money velocity (v) means the number of transactions mediated by a monetary unit in a certain period of time. Both the money velocity and the quantity of goods and services traded in the economy are constant in the short term. Thus, changing the volume of money supply will cause a change in the same direction of the general price level generating inflation or deflation as appropriate.

2. THEORETICAL CONSIDERATION

During the development work we have considered the literature on both, the definition of non-performing loans as well as the factors that generate the degradation of a performing loan to a non-performing loan and their influence on the general macroeconomic climate.

Broad money (M3) consists mainly of currency in circulation - a component of the monetary base held by non-bank - and bank deposits (demand and term) held by non-bank clients. This represents the stock of money used by owners to purchase goods, services and non-monetary assets (stocks and housing).

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The Central Bank does not create money in classical way of cash print, but through monetary policy operations providing liquidity against eligible collaterals – according with requisite for maintaining the operational objective of monetary policy at the levels within the monetary policy decisions. Operation of liquidity providing is one of the main levers through which Central Bank monetary policy exerts its attributes. It is interesting to research how this leverage was used in autumn 2008, during the speculative attacks against national currency. At times the central bank has used this leverage in an "unconventional" (Croitoru, Lucian. 2012 "Monetary Policy - Unconventional Aspects") way. In another sense, the issuance of printing cash money (in the sense as is popularly understood) is another task of the Central Bank by virtue of the function assigned to it by law and the Statute of the National Bank of Romania. Is worth to mention that with the expansion of electronic payment systems, this phrase remains only a figure of speech, the central bank using subtle methods of injecting cash into the market.

The money supply created by commercial banks through credit is the main instrument of broad money generator. In this regard, we will analyze the influence of this kind of increase in the volume of money supply in the assembly generically called "economy". The Central Bank has an indirect and imperfect influence on the money supply generated by banks the volume in the economy being driven mainly by the natural behavior of commercial banks in terms of granting loan, tracking its own profits. In this regard, the central bank's policies to stimulate lending or restricting various forms of lending in line with the needs of the real economy, are part of the indirect control leverage of this composition of broad money. Contrary to the assumptions of monetary theory, money multiplier has proven to be unstable and unpredictable, being strictly linked to the conjunctural and commercial behavior of the banks.

For defining a non-performing loan (NPL) we will consider some considerations unanimously accepted:

According to Moody's Investors Service: A loan is considered to be non-performing in the following situations:

- for consumer loans, if the overdue principal or interest exceeds 60 days past due;
- for commercial lending and leasing, if the overdue principal or interest exceeds 90 days past due;
- any loan for which clear indications of non-performance are registered.

According to regulations, in the case of Romania, all the outstandings over 90 day past due or for which legal proceedings have been registered are included in the category of non-performing loans. Based on the regulations of banking prudence, Romanian banks are required to the provisioning of credit risk, credit classification criteria being based on the number of overdue days, regulations being more severe than the one used in most countries.

The provision made by commercial banks in Romania are done accordingly with the categories of credit within its portfolios. According to the regulations of the National Bank of Romania (BNR), commercial banks are required to regularize monthly specific risk provisions and to establish provisions by considering an expense. The reduction or cancellation provision will be made by considering them an income. The provisions regulating proceed as follows:

- a) if the required risk provisions level is higher than the provisions made, then the gap will be included within income,
- b) if necessary risk provisions level is less than the provisions made in the accounts, the difference is expensed.

It should be clarified that the Romanian banks will regulate provisions for risk using the loans currency. The assesment of the credit risk provisions is done by applying a specific coefficient corresponding to each credit category by considering the entire exposure, regardless of collateral for any credit which has been classified "loss", for loans were legal proceedings had been initiated or where at least one installment recorded over 90 days past due.

From the perspective of this analyze, the provisioning which covers credit risk, are practically funds blocked by the commercial banks, fact which decrease the money multiplier with direct influence on money supply generated by banks. In the study - Macroeconomic factors and banking determinants of NPLs in Greece - Louzis, Vouldis and Metaxas (2010) shows that the indicator of non-performing loans in total loan portfolio of a commercial bank is influenced by factors such quality of management and macroeconomic factors. To be noted that the study was done on 9 banks in Greece and included analysis of consumer, mortgage and business loans.

Table 1. Evolutions of money supply, inflation and non-performing loans in Romania between 2009 – 2014

| Data | M3 ⁱ - real annual change - (%) | Inflation -CPI (annual total)- (%) | NPLs evolution (%) |
|----------|--|--|-----------------------|
| iun.09 | 101,94 | 5,86 | - |
| sept.09 | 103,16 | 4,94 | 6,46* |
| dec.09 | 100,18 | 4,74 | 7,89* |
| mar.10 | 102,69 | 4,20 | 9,11* |
| iun.10 | 100,33 | 4,38 | 10,20* |
| sept.10 | 103,59 | 7,77 | 11,67* |
| dec. 10 | 96,82 | 7,96 | 11,85* |
| mar. 11 | 101,82 | 8,01 | 12,71* |
| iun. 11 | 104,61 | 7,93 | 13,35* |
| sept. 11 | 103,38 | 3,45 | 14,18* |
| dec. 11 | 100,03 | 3,14 | 14,33* |
| mar.12 | 100,30 | 2,40 | 15,88* |
| iun.12 | 101,88 | 2,04 | 16,76* |
| sep.12 | 100,45 | 5,33 | 17,34* |
| dec.12 | 101,49 | 4,95 | 18,24* |
| mar.13 | 101,09 | 5,25 | 19,08* |
| iun.13 | 101,65 | 5,37 | 20,30* |
| sep.13 | 104,33 | 1,88 | 21,56* |
| dec.13 | 99,26 | 1,55 | 21,87* |
| mar.14 | 100,02 | 1,04 | 22,26* / 20,26** |
| iun.14 | 101,52 | 0,66 | 19,19** |
| sep.14 | 107,56 | 1,54 | 15,33** |
| dec.14 | 101,94 | 0,83 | 13,93** |

Source: Precessed by the authors according NIS and NBR

ⁱCalculations made by the authors according NIS and NBR

*calculation according IAICT_RCN: Gross exposure of non-bank loans and interest classified as loss 2 that is overdue more than 90 days and /or for which legal proceedings were initiated against the debtor or against the operation / Total classified non-bank loans and related interest, excluding off-balance sheet items.

** calculation according IAICT_RCNN: Determined based on reports from all banks: both those which use the standard approach in assessing credit risk and those applying internal rating models.

Studies by Raphael Espinoza and Abdelhak Senhadji (2010) on the influence of non-performing loans and their effects generated on macroeconomic conjuncture in the countries of the Persian Gulf, reveals the same kind of approach, the increase in bad loans, will lead to a diminishing of the economic growth and to a rise of the interest rates.

The concern on the issue developed by the large volume of non-performing loans arising from the financial crisis in the countries of Central, Eastern and South Eastern Europe and the drag which they bring into the future macroeconomic sustainable development is supported also by IMF Working Group on NPLs in Central, Eastern and Southeastern Europe, working group that is analyzing the non-performing loans within the European Banking Coordination "Vienna" Initiative. The data on the evolution of non-performing loans as a share of total portfolio presented in Table. 1.

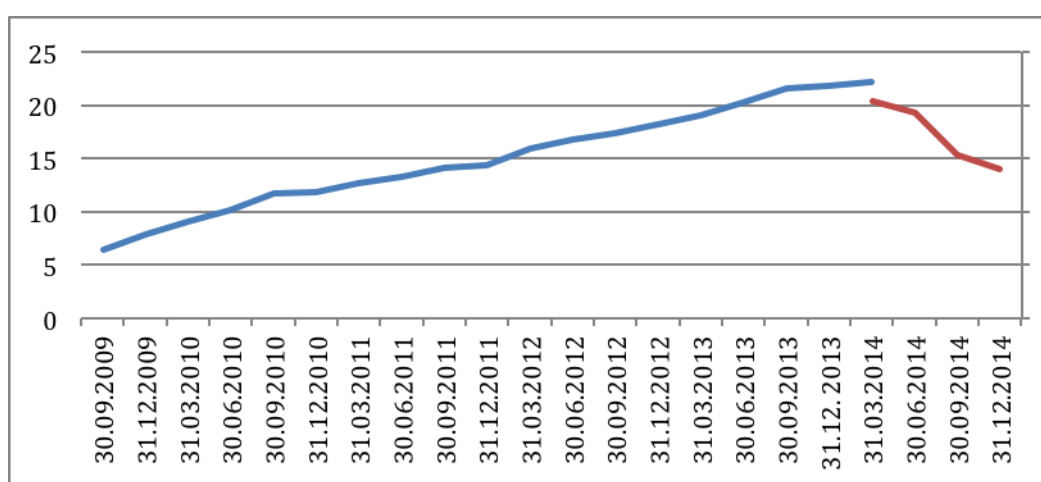


Figure 1. NPLs evolution in Romania, between 2009-2014

Source: Processed by authors according NIS and NBR

As we can observe they have followed a continuous upward trend from September 2009 to March 2014. The increase was 244.58%, from 6.46% in September 2009 to 22.26% in December 2014 according to data presented by the NBR as resulting calculation imposed by IAICT_RCNN standard. Since March 2014, the NPL began to experience a downward trend reaching 13.93% level in December 2014, compared to 20.26% (according to the calculation IAICT_RCNN) as it was in March 2014, 31.24% of decline.

Curve downward path has 3 major inflection point: in June 2014, August 2014 and December 2014 - marked moments with massive sales of non-performing loans portfolios by two significant banks : VB and BCR. The transferred volumes, of non-performing loans as they were made public, are of EUR 495 million by VB and EUR 440 million, by BCR.

Cash (found in component M1) is the most sensitive and show a greater inflationary pressures in monetary terms. But currency in circulation depends heavily on popular demand, if it keeps in banks or in cash, it's just a matter of trust" said the NBR governor Mugur Isarescu at the Seminar 6 organized by NBR on March 2012.

Correlation cash / inflation works on a long term horizont, not on short-term. But in Romania, facing a decrease in household income due to austerity measures imposed by the government in 2010, the population has shown a penchant for keeping more money in cash compared with the previous period. This phenomenon is justified by the economic crisis which hit in that time and a lack of confidence faced by the population.

Most times the price increase was not direct linked with the evolution of money supply. "Not always if you increase the money supply means an inflation growth ... between inflation and money supply occur at least two variables: velocity of circulation of money and the quantity of goods produced and exchanged," said the NBR governor at the seminar mentioned above.

History shows that when there is an increase in the money supply, most of the times is not backed by an increase in national production of goods and services (Y). Probabilistically speaking quantitative increase in money supply has the effect of price increasing in the economy.

According with the quantitative equation of money, considering the quantity of goods and services in the economy and the velocity of money circulation remained relatively constant, when the money supply decreases, prices should fall. The inflation registered in Romania in the period 2009 - 2014 (see Table 1), we note that, on the contrary, the inflation recorded an upward trend, the consumer price index reaching 7.77 at 30.09.2010, from 4.38 recorded at 30.06.2010. The upward trend in inflation was kept until 31.03.2011, when the CPI registered a value of 8.01. At the end of the second quarter of 2011, the CPI was just by 0.08 points below the level recorded at the end of the previous quarter, then it began to decline.

The velocity of money is another variable which influence broad money. Typically, money supply is higher in a country with low inflation than in a country with high inflation, but the perception is exactly the reverse, because of the velocity of money, inversely proportional to the confidence in the national currency. In a country with low inflation the money " are kept", and in a country with high inflation money moves faster.

The long-term relationship between money (money supply) and prices - empirically proven - it is widely accepted by central banks. Modern central banks do not use money supply for understanding, predicting and controlling inflation, but monetary indicators have a strong relevance for the conduct of monetary policy.

Milton Friedman (1984): monetary aggregates may have a role as an indicator, even if they do not have a causal role in the structural or inflation or monetary policy transmission mechanism. Even if inflation can be seen as a result of excess aggregate demand (M·v) or of cost pressures, monetary developments can still offer information to enable better identification of the nature of shocks that hit the economy and / or provide trend of future development prices.

Monetary targeting strategy was widely adopted in the 1970's by the US, Canada, UK, Switzerland, Germany, Japan. Since the 1980s monetary targeting strategy was gradually abandoned, since the relationship between the money supply and nominal GDP became increasingly volatile. Milton Friedman acknowledges in 2003 that monetary targeting was not the success as he hoped. Romania's experience of the past 20 years is relatively similar, monetary targeting was adopted in the early 1990s being replaced in early 2000s with an eclectic strategy and subsequently with inflation targeting.

3. PRESENTATION OF DATABASE AND RELATIONS BETWEEN ANALISED INDICATORS CALCULATION

In our article we intend to analyze the relationship between the share of non-performing loans in the total loan portfolios of banks, especially to velocity of non-performing loans rise, on the one hand, and the annual inflation rate and money supply, on the other hand.

From the economic point of view, we can expect that the relationship between the growth rate of non-performing loans and the inflation rate is significant in the sense of a direct correlation between the rate of growth of non-performing loans and annual inflation rate evolution.

3.1. Defining the working hypotheses

We defined: RI = inflation rate, MM = broad money M3 rate, CRN = non-performing loans rate, CRN_REC = rectificated rate of non-performing loans.

We defined VCRN as the quarterly growth rate (growth velocity) of non-performing loans ratio (= $CRN_1 / CRN_0 - 1$) and VCRN_REC quarterly growth rate of non-performing loans rate - rectificated version (= $CNR_REC_1 / CNR_REC_0 - 1$).

To reach the objective of this article, i.e. to analyze the impact of the increasing rate of non-performing loans, on one hand, and the annual inflation rate and broad money, on the other hand, we chosed data published by NBR with regard on non-performing loan's share in total bank loan portfolio, evolutionary rates of broad money and the evolution of annual CPI, published by INS. Statistical embossing were performed in Excel and Eviews.

3.2. The limitations of econometric analysis

Our econometric analysis starts with some limitations caused by method, data availability and presentation of results. We believe these limitations are not critical for empirical testing, but must be considered in the light of the appropriate interpretation of the results.

- Methodological limitation: the analysis is done only on the basis of historical data available (23 quarters) and does not purport to extrapolate future results.
- Information refers to the banking sector, considered homogeneous for this analysis data.

3.3. Descriptive statistical analysis of the correlation

Econometric analysis will be made on the assumption of direct / inverse correlation between the growth rate (velocity) of total non-performing loans in the banking system and broad money and inflation rates. We analyze three models of correlation between inflation and the two macroeconomic indicators, that we considered significant: broad money and volume of non-performing loans, as follow:

3.3.1. Model 1: $RI \sim MM ; VCRN$

We studied quarterly data on inflation rate, broad money M3 and NPLs velocity during September 2009 - June 2015 according to Table 1 of Annex.

Table 2. Descriptive statistical for model 1

| | RI | MM | VCRN |
|--------------|-----------|-----------|-----------|
| Mean | 3.637391 | 2.804348 | 0.034490 |
| Median | 3.450000 | 3.600000 | 0.050354 |
| Maximum | 8.010000 | 10.60000 | 0.221362 |
| Minimum | -1.550000 | -5.100000 | -0.201146 |
| Std. Dev. | 2.699352 | 4.037155 | 0.094268 |
| Skewness | 0.174654 | -0.240678 | -0.604880 |
| Kurtosis | 2.154883 | 2.365205 | 3.626825 |
| Jarque-Bera | 0.801396 | 0.608225 | 1.779077 |
| Probability | 0.669852 | 0.737778 | 0.410845 |
| Observations | 23 | 23 | 23 |

Source: Processed by authors according NIS and NBR

Regarding the evolution of these variables, a significant probability can be observed that these sets of data have a normal distribution. Skewness and kurtosis indicators are close to normal values (≈ 0 , respectively ≈ 3).

Testing the correlation of independent variables

In the first phase we have tested the correlation of the influence factors (RI, MM, VCRN) in order to verify what factors determine each other or are independent.

Table 3. Correlation between analyzed independent factors

| | | | |
|------|-----------|-----------|-----------|
| | RI | MM | VCRN |
| RI | 1.000000 | -0.893144 | 0.536110 |
| MM | -0.893144 | 1.000000 | -0.277060 |
| VCRN | 0.536110 | -0.277060 | 1.000000 |

Source: Processed by authors according NIS and NBR

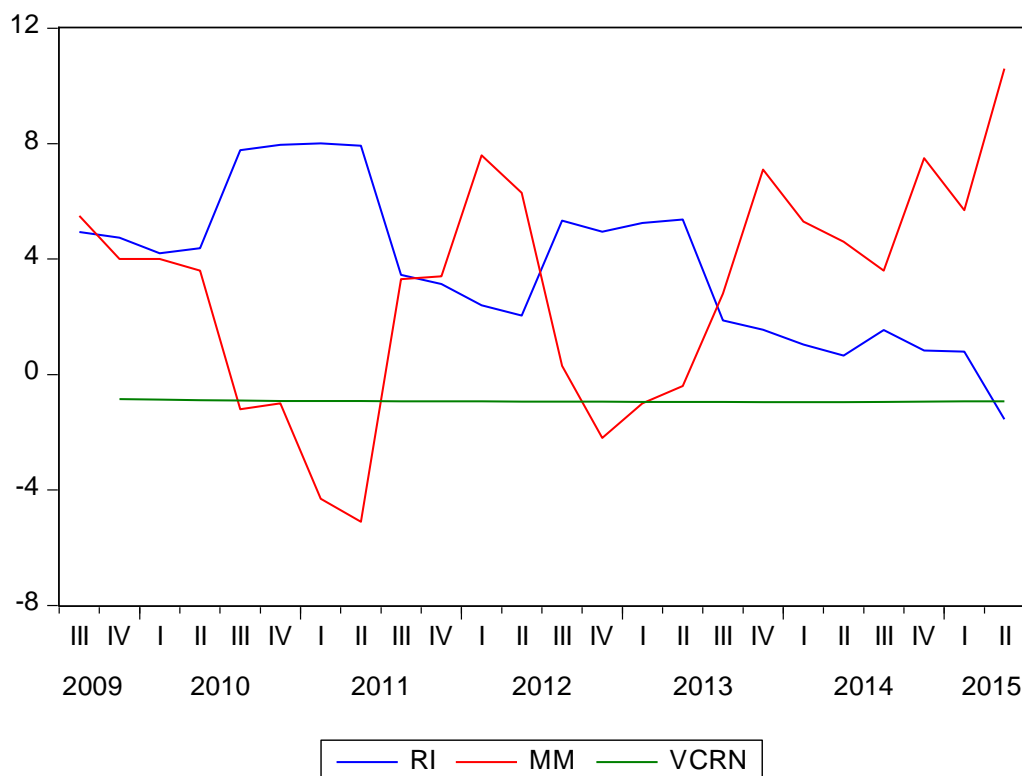


Figure 2. Evolution of RI, MM and VCRN between 2009 and 20015

Source: Processed by authors

- RI correlates negatively with MM. Although it seems to be an adversarial relationship we put on the real-time action of the central bank monetary policy which corrects macroeconomic imbalances through the monetary policy.
- The correlation matrix also highlights intense correlations between RI and MM (-0.89) between RI and VCRN (0.53) and average correlation between MM and VCRN (-0.28)

Table 4. Testing the significance of model 1

Dependent Variable: RI

Method: Least Squares

Date: 11/27/15 Time: 17:07

Sample (adjusted): 12/01/2009 6/01/2015

Included observations: 23 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|--------|
| C | 34.03139 | 6.600895 | 5.155572 | 0.0000 |
| MM | -0.581221 | 0.048323 | -12.02775 | 0.0000 |
| VCRN | 31.04299 | 7.130518 | 4.353540 | 0.0003 |

| | | | |
|--------------------|-----------|-----------------------|----------|
| R-squared | 0.896135 | Mean dependent var | 3.637391 |
| Adjusted R-squared | 0.885749 | S.D. dependent var | 2.699352 |
| S.E. of regression | 0.912410 | Akaike info criterion | 2.775654 |
| Sum squared resid | 16.64986 | Schwarz criterion | 2.923762 |
| Log likelihood | -28.92002 | Hannan-Quinn criter. | 2.812903 |
| F-statistic | 86.27893 | Durbin-Watson stat | 1.653628 |
| Prob(F-statistic) | 0.000000 | | |

Source: Processed by authors

Multiple linear regression was used, considering all factors initially introduced into the equation (Model 1). The results obtained are shown below: **RI = 34,03 - 0.58 * MM + 31,04 * VCRN**. Multiple regression in this Model 1 explains that when RI increases significantly when also VCRN increases.

The correlation is good with an adjusted R² = 88.6%, with significant coefficients from statistically point of view, at both MM (- 0.58) and VCRN (+ 31.04) and on the entire model (see probabilities zero that the coefficients are close to zero, which means that they are significant in terms of statistics). The statistic Durbin-Watson of 1.65 is close to the range of [1.8; 2,2], so we have very little autocorrelation between series of residual terms (model estimation errors).

3.3.2. Model 2 : RI ~ MM ; VCRN_REC

In this model we will analyze correlations between the same macroeconomic indicators but the velocity of growth in non-performing loans recalculated version (VCRN_REC)

Table 5. Testing the significance of model 2

Dependent Variable: RI
 Method: Least Squares
 Date: 11/27/15 Time: 17:49
 Sample (adjusted): 12/01/2009 6/01/2015
 Included observations: 23 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| C | 4.822830 | 0.271697 | 17.75078 | 0.0000 |
| MM | -0.535517 | 0.052419 | -10.21612 | 0.0000 |
| VCRN_REC | 9.246837 | 2.309932 | 4.003077 | 0.0007 |
| R-squared | 0.887691 | Mean dependent var | 3.637391 | |
| Adjusted R-squared | 0.876460 | S.D. dependent var | 2.699352 | |
| S.E. of regression | 0.948774 | Akaike info criterion | 2.853815 | |
| Sum squared resid | 18.00343 | Schwarz criterion | 3.001923 | |
| Log likelihood | -29.81887 | Hannan-Quinn criter. | 2.891064 | |
| F-statistic | 79.04026 | Durbin-Watson stat | 1.684064 | |
| Prob(F-statistic) | 0.000000 | | | |

Source: Processed by authors

Synthesized results of the above table: **RI = 4,823 – 0,536 * MM + 9,247 * VCRN_REC**.

Economic conclusion is similar to the first model: RI will increase when MM decreases and increases significantly when you increase VCRN_REC.

The correlation is good with an adjusted $R^2 = 87.6\%$, with significant coefficients statistically viewed for both MM and the VCRN_REC and for the entire model (see zero probability for these coefficients to be close to zero, which means that they are significant in terms of statistics).

Compared to the previous state = Durbin-Watson statistic 1.68 is slightly closer by the range of [1.8; 2,2], so we have very little autocorrelation between series of residual terms (model estimation errors). After elimination of the variables with insignificant coefficients on statistically basis, resulted the following model 3 that meets most of the criteria for validation of regression.

3.3.3. Model 3: VRI ~ VCRN

In this model we analyze the possible correlation between the growth rate of inflation (VRI) the volume of non-performing loans (VCRN). We studied quarterly data of VRI and VCRN during September 2009 - June according to Table 2 in Annex.

Table 6. Descriptive statistics for model 3 has the following values

| | RI | VCRN |
|---------------------|-----------|-------------|
| Mean | 3.637391 | 0.034490 |
| Median | 3.450000 | 0.050354 |
| Maximum | 8.010000 | 0.221362 |
| Minimum | -1.550000 | -0.201146 |
| Std. Dev. | 2.699352 | 0.094268 |
| Skewness | 0.174654 | -0.604880 |
| Kurtosis | 2.154883 | 3.626825 |
| | | |
| Jarque-Bera | 0.801396 | 1.779077 |
| Probability | 0.669852 | 0.410845 |
| | | |
| Observations | 23 | 23 |

Source: Processed by authors

Table 7. The correlation matrix shows an intense correlation between RI and VCRN ($\rho = 0.536$).

| | RI | VCRN |
|-------------|-----------|-------------|
| RI | 1.000000 | 0.536110 |
| VCRN | 0.536110 | 1.000000 |

Source: Processed by authors

The model shows a significant correlation between the two indicators which encourages us to study this econometric model.

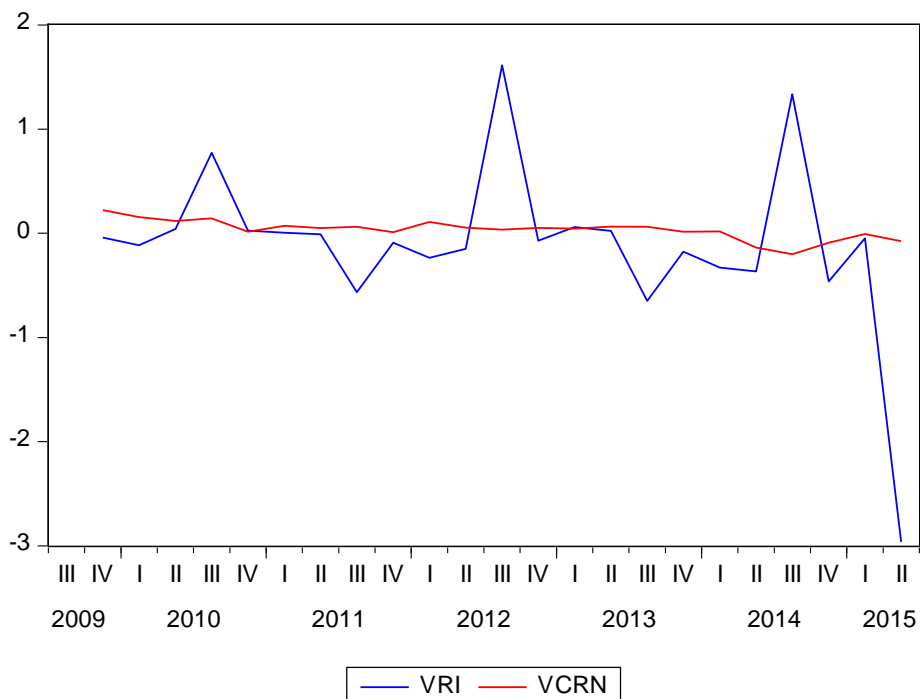


Figure 3. Evolutions of VRI and VCRN between 2009 and 2015

Source: Processed by authors

But in terms of graphics is not identified a significant correlation between RI and VCRN.

Table 8. Testing the significance of model 3

Dependent Variable: RI
 Method: Least Squares
 Date: 11/27/15 Time: 18:00
 Sample (adjusted): 12/01/2009 6/01/2015
 Included observations: 23 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| C | 3.107915 | 0.519229 | 5.985637 | 0.0000 |
| VCRN | 15.35139 | 5.274764 | 2.910347 | 0.0084 |
| R-squared | 0.287414 | Mean dependent var | | 3.637391 |
| Adjusted R-squared | 0.253481 | S.D. dependent var | | 2.699352 |
| S.E. of regression | 2.332276 | Akaike info criterion | | 4.614508 |
| Sum squared resid | 114.2297 | Schwarz criterion | | 4.713246 |
| Log likelihood | -51.06684 | Hannan-Quinn criter. | | 4.639340 |
| F-statistic | 8.470118 | Durbin-Watson stat | | 0.745609 |
| Prob(F-statistic) | 0.008366 | | | |

Source: Processed by authors

It confirms the previous economic conclusion: RI will increase when VCRN increases.

$$RI = 3.108 + 15.351 * VCRN$$

But the correlation is low (adjusted R² = 25%) with a significant coefficient statistically speaking of VCRN (see 0.0084 probability that this factor should be close to zero, which means that it is statistically significant).

Unfortunately, the Durbin-Watson stat = 0.7456 is too far from the range [1.8; 2.2], so we have an intense series of autocorrelation between residuals (errors of estimation of the model).

In the Annex we enrolled Model 4 with analysis of the correlation between inflation rate and rhythm recalculated non-performing loans. The Model 4 is not statistically more efficient than Model 3.

As conclusion, the models 1 and 2 are the most performant ones, when the inflation rate in correlation with both the broad money and the NPL's are considering together.

4. CONCLUSIONS

Although the trend shows a decrease of non-performing loans in the banking system, the debt selling process from legal point of view is debt assignment and from an accounting perspective a derecognition of the total debt and therefore a write-off of the entire debt from banking balances. However, even though the claim has been assigned, the economic reality remains practically equally affected. According to information circulating on the market, the price of the assignment, is in the range of 7-8% of the debt value, this contribution can not compensate the rising volumes of provisions made.

For the period studied within this work, the fluctuation of the non-performing loans in total loans in the banking system is directly influencing the inflation and banks are in the situation to reduce the volumes of new loans granted due to increased credit risk provisions. The decreased lending appetite of the banks leads to a decrease of the velocity of money in the economy, having also a direct influence on inflation and ultimately leading to its inclusion in an emphasized downtrend.

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APPENDIX

Table 1. Data for model 1: Quarterly data on inflation rate, broad money M3 and NPLs velocity in Romania, between September 2009 - June 2015

| Obs | RI | MM | VCRN |
|------------|-----------|-----------|-----------|
| 9/01/2009 | 4.940000 | 5.500000 | NA |
| 12/01/2009 | 4.740000 | 4.000000 | -0.845201 |
| 3/01/2010 | 4.200000 | 4.000000 | -0.873257 |
| 6/01/2010 | 4.380000 | 3.600000 | -0.890231 |
| 9/01/2010 | 7.770000 | -1.200000 | -0.901961 |
| 12/01/2010 | 7.960000 | -1.000000 | -0.914310 |
| 3/01/2011 | 8.010000 | -4.300000 | -0.915612 |
| 6/01/2011 | 7.930000 | -5.100000 | -0.921322 |
| 9/01/2011 | 3.450000 | 3.300000 | -0.925094 |
| 12/01/2011 | 3.140000 | 3.400000 | -0.929478 |
| 3/01/2012 | 2.400000 | 7.600000 | -0.930216 |
| 6/01/2012 | 2.040000 | 6.300000 | -0.937028 |
| 9/01/2012 | 5.330000 | 0.300000 | -0.940334 |
| 12/01/2012 | 4.950000 | -2.200000 | -0.942330 |
| 3/01/2013 | 5.250000 | -1.000000 | -0.945175 |
| 6/01/2013 | 5.370000 | -0.400000 | -0.947589 |
| 9/01/2013 | 1.880000 | 2.800000 | -0.950739 |
| 12/01/2013 | 1.550000 | 7.100000 | -0.953618 |
| 3/01/2014 | 1.040000 | 5.300000 | -0.954275 |
| 6/01/2014 | 0.660000 | 4.600000 | -0.955076 |
| 9/01/2014 | 1.540000 | 3.600000 | -0.947890 |
| 12/01/2014 | 0.830000 | 7.500000 | -0.934768 |
| 3/01/2015 | 0.790000 | 5.700000 | -0.928212 |
| 6/01/2015 | -1.550000 | 10.60000 | -0.927798 |

Source: Processed by authors according NIS and NBR

Table 2. Data for Model 3: Inflation rate and NPLs volume evolution in Romania, between September 2009 and June 2015

| Obs | VRI | VCRN |
|------------|-----------|----------|
| 9/01/2009 | NA | NA |
| 12/01/2009 | -0.040486 | 0.221362 |
| 3/01/2010 | -0.113924 | 0.154626 |
| 6/01/2010 | 0.042857 | 0.119649 |
| 9/01/2010 | 0.773973 | 0.144118 |
| 12/01/2010 | 0.024453 | 0.015424 |
| 3/01/2011 | 0.006281 | 0.072574 |
| 6/01/2011 | -0.009988 | 0.050354 |
| 9/01/2011 | -0.564943 | 0.062172 |
| 12/01/2011 | -0.089855 | 0.010578 |
| 3/01/2012 | -0.235669 | 0.108165 |
| 6/01/2012 | -0.150000 | 0.055416 |
| 9/01/2012 | 1.612745 | 0.034606 |
| 12/01/2012 | -0.071295 | 0.051903 |

| | | |
|------------|-----------|-----------|
| 3/01/2013 | 0.060606 | 0.046053 |
| 6/01/2013 | 0.022857 | 0.063941 |
| 9/01/2013 | -0.649907 | 0.062069 |
| 12/01/2013 | -0.175532 | 0.014378 |
| 3/01/2014 | -0.329032 | 0.017833 |
| 6/01/2014 | -0.365385 | -0.137916 |
| 9/01/2014 | 1.333333 | -0.201146 |
| 12/01/2014 | -0.461039 | -0.091324 |
| 3/01/2015 | -0.048193 | -0.005743 |
| 6/01/2015 | -2.962025 | -0.075812 |

Source: Processed by authors according NIS and NBR

Model 4. RI ~ VCRN_REC

Table 3: Testing the significance of model 4

Dependent Variable: RI
 Method: Least Squares
 Date: 11/27/15 Time: 18:08
 Sample (adjusted): 12/01/2009 6/01/2015
 Included observations: 23 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| C | 3.083814 | 0.515342 | 5.984014 | 0.0000 |
| VCRN_REC | 16.18159 | 5.373216 | 3.011528 | 0.0066 |
| R-squared | 0.301613 | Mean dependent var | | 3.637391 |
| Adjusted R-squared | 0.268357 | S.D. dependent var | | 2.699352 |
| S.E. of regression | 2.308922 | Akaike info criterion | | 4.594380 |
| Sum squared resid | 111.9535 | Schwarz criterion | | 4.693118 |
| Log likelihood | -50.83536 | Hannan-Quinn criter. | | 4.619212 |
| F-statistic | 9.069303 | Durbin-Watson stat | | 0.805839 |
| Prob(F-statistic) | 0.006644 | | | |

Source: Processed by authors

This model confirms again the previous economic conclusion: RI will increase when VCRN drops.

$$RI = 3,084 + 16,182 * VCRN_REC$$

The correlation is even lower (adjusted $R^2 = 27\%$), with statistically significant coefficient VCRN_REC prs. (see the probability of that coefficient 0.0066 (the 16 182) to be close to zero, which means that it is statistically significant).

Unfortunately, even if statistic Durbin-Watson= 0.8058 is somehow better than in model 3 is too far from the range of [1.8; 2.2], so we have an intense autocorrelation between residuals series (errors of estimation of the model)

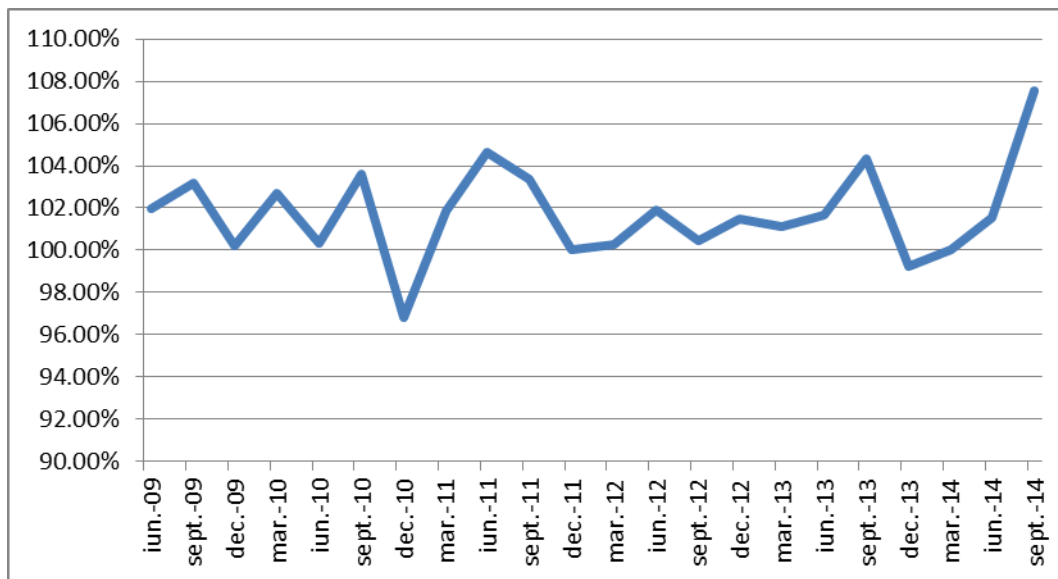


Figure 1. M3 evolution in Romania, between 2009 and 2014
 Source: Processed by authors according NIS and NBR

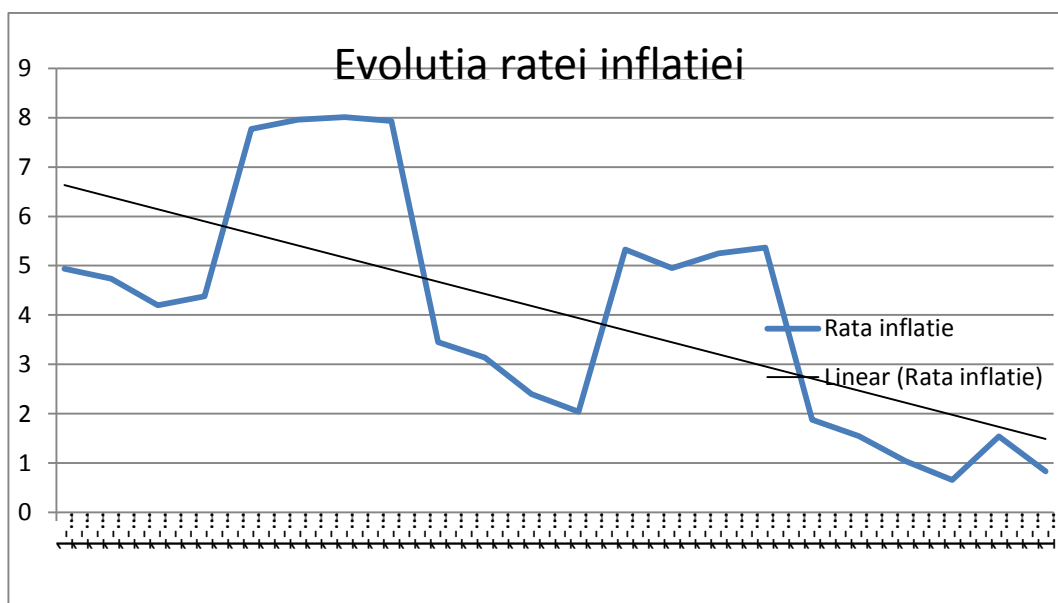


Figure 2. Inflation rate evolution in Romania, between 2009 and 2014
 Source: Processed by authors according NIS and NBR