

# STUDY OF CORRELATION BETWEEN AVERAGE INTEREST RATE AND NON-PERFORMING LOANS IN THE ROMANIAN BANKING SYSTEM DURING 2006- FEBRUARY 2010

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*This paper aims to examine the correlation between average interest rate and non-performing loans in the Romanian banking system during 2006-February 2010. We based our approach on the Pearson correlation coefficient and we realized an empirical study, which demonstrates how these relevant banking elements are connected. Also, the result of this research suggests that there are other indirect channels which affect the non-performing loans.*

*Key Words: Pearson correlation coefficient, Non-performing loans, Average interest rate, Credit-risk provisions.*

*JEL Codes: G21, E22, D63.*

## **1. Introduction**

Romania was affected by the deteriorating of the external economic environment, associated with the international financial crisis. Unfortunately, since 2007, we frequently use and hear the notion of financial crisis and the various causal factors at the heart of the crisis. There are in the specialized literature multiple trials to explain the elements contributing to the deterioration of the economic conditions, in their acceptance of the premises of the crisis.

We remark the major vulnerability of the banking domain, derived from its key position in the financial system. The loan portfolio quality deteriorated during the past periods and the bank reported higher levels of overdue and doubtful loans. We attend to a worsening of the payment behaviour of the banking borrowers. Romania is in a particular situation regarding the banking loans reporting. The national reporting standards impose higher coverage by provisions of bad loans in the annual financial reporting statement of the credit institutions from Romania than European requirements.

Based on these clues, the paper identifies the worsening of the banking loan portfolio and presents this deterioration like a matter of concern. An empirical study is included to demonstrate how the average interest rate and non-performing rate are connected. We develop a research hypothesis Pearson's correlation coefficient and we study the situation of the Romanian banking system during 2006-February 2010.

## **2. Theoretical background**

In Romania, the non-performing loans<sup>495</sup> reveal past due amounted to 49.101,60 Bn lei in February 2010, and were up from 4.879,70 Bn lei in January 2006. The first variable of our study is the average interest rate. According to the National Bank of Romania's publications<sup>496</sup>, starting with January 2007, average interest rates on deposits and loans and average interest rates on new business are calculated based on the provisions of National Bank of Romania Norms No.

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<sup>495</sup> National Bank of Romania, *Monthly Bulletins*, February 2010.

<sup>496</sup> National Bank of Romania, *Monthly Bulletins*, 2006-February 2010.

14/2006<sup>497</sup> concerning the statistics of interest rates applied by credit institutions, transposing the provisions of Regulation ECB/2001/18 concerning statistics on interest rates applied by monetary financial institutions to deposits and loans vis-à-vis households and non-financial corporations. Average interest rates are calculated as an arithmetic mean of annualized agreed rates weighted by the outstanding amounts of loans/deposits at the end of the reported month or by the extended/taken amounts during the reported month in relation to new business. The annualized agreed rate is the interest rate agreed between the credit institution and the customer for a deposit or loan, converted to an annual basis and quoted in percentages per annum. According to the provisions of the above-mentioned Norms, average interest rates are determined for the institutional sectors “Non-financial Corporations” and “Households” as well as for the following balance sheet items: loans (total), bank overdrafts, loans for house purchases, consumer loans, loans for other purposes (including loans for business consolidation extended to freelancers and household associations), overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repos.

Regarding to the second variable of our research, we underline that Romania has a primary regulatory framework governing loan classification and provisioning since 2002<sup>498</sup> and multiple amendments. Any credit institutions have to classify their loans in one of the following categories: Standard, Watch, Substandard, Doubtful, Loss. In 2009 National Bank of Romania issued a new regulation<sup>499</sup>, which established the more flexible criteria for loan classification and provisioning. According to this settlement, the collateral relating to exposures representing the principal of loans/investments classified under “loss”, where the debt service outstanding exceeds 90 days and/or where legal proceedings were taken against the operation or the debtor, shall be adjusted by applying the coefficients set by the lender for each type/case. The level of coefficients may not be higher than 0.25. The lender must have the laying-out documents for setting the level of coefficients laid down in the regulation. In accordance with the new regulation, the collateral relating to exposures representing the current/outstanding interest on the above-mentioned loans/investments shall not be taken into consideration, and the coefficient applied to the collateral amount shall be equal to zero. The amendment will translate into lower provisions for such assets, as the surplus is to be recorded under income, thus benefiting the health of financial and prudential indicators<sup>500</sup>.

The role of the interest rate in the banks is recognized by many authors. The values of assets and liabilities of financial institutions are considered subject to fluctuations in interest rate by Cox and Prasad<sup>501</sup>. They studied the differential impact in interest rate changes between assets and liabilities which is referred to, in banking, as interest rate risk. Of all threats to bank competitiveness this risk dwarfs all others. Banks traditionally have dealt with interest rate risk by restructuring their loan portfolios. The authors developed a model to measure interest rate risk, called the Degree of Interest Rate Sensitivity (DIRS), and demonstrated its effectiveness for banks to compete. The others authors<sup>502</sup> examine the interest rate risk management (IRRM) practices of UK-listed companies. In particular, they examined the significance of interest rate

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<sup>497</sup> Published in Official Gazette of Romania no. 679/2006.

<sup>498</sup> Regulation no. 5/2002 issued by the National Bank of Romania, regarding the classification of loans and investments, as well as establishment, adjustment and use of credit-risk provisions, published in Official Gazette of Romania no. 626/2002

<sup>499</sup> Regulation no. 3/2009 issued by the National Bank of Romania, published in Official Gazette of Romania no. 626/2009

<sup>500</sup> National Bank of Romania, *Financial Stability Report*, 2009, p. 33

<sup>501</sup> Cox, R.A.K., Prasad, R.M. (1995). Bank competitiveness in the face of interest rate risk, *Competitiveness Review: An International Business Journal incorporating Journal of Global Competitiveness*, Vol. 5, Issue 2, pp. 84-89

<sup>502</sup> Dhanani, A., Fifield, S., Helliard, C. and Stevenson, L. (2008). The management of interest rate risk: evidence from UK companies, *Journal of Applied Accounting Research*, Vol. 9, Issue 1, pp. 52-70.

risk (IRR) to these companies as well as the risk management practices adopted, including: the methods used to assess the level of IRR and the types of interest rate forecasts used in the process; derivatives activity; and corporate governance, reporting and control. The results of this research suggest that IRR is important to UK companies and that their IRR hedging strategies are geared towards managing shareholder considerations and protecting banking covenants and corporate credit ratings.

We identify the studies that seek to explain the evolution of the non-performing loans in the banking industries. For example, Hall<sup>503</sup> presented his opinion about the truth in the scale of the Japanese bank's bad debt and tried to answer to the question: if the situation manageable? The author explained a concept of "accounting forbearance", which is used to mask the true level of the banks' bad debts. The banking industry's ability to handle the continuing bad debt problem, in the face of a significant impairment of economic capital and the market's relentless drive for full disclosure and transparency, also is assessed.

The others authors<sup>504</sup> examined the factors which affect loss provision for loans and investment in Murabaha, Musharka, and Mudarabah for banks in the Gulf Cooperation Council (GCC) region. The effect of prior period earnings, legal and statutory reserves, size of the bank, level of debt, and loan and investment to deposit ratio on the loss provisions of banks are examined for the period 2000-2003.

In 2007, Bandyopadhyay, Chherawala and Saha<sup>505</sup> empirically calibrated the default and asset correlation for large companies in India and elaborate its implications for credit risk capital estimation for a bank.

### 3. Empirical findings and interpretations

We studied the correlation between average interest rate and non-performing rate, based on the Pearson correlation coefficient.

$$p = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}} \quad (1)$$

It indicates the extent of relationship by a number between 1.00 and -1.00. The correlation is computed from pairs of scores for each individual in the sample; each individual has a pair of scores, one on each of the two variables on which the correlation is being computed. A correlation of one indicates a perfect relationship such that if we know that the individual has the highest score on one variable, we also know she has the highest score on the other. With a negative correlation, they track one another inversely. A correlation of less than one, either positive or negative, indicates that each member of a pair of scores attracts the other less than perfectly so that the highest score on one variable in a positive correlation might be accompanied by a medium high score on the other variable. The fact that the relationship exists as shown by a correlation does not allow us to infer that the relationship is causal. Often the relationship is the result of a third variable or a combination of other variables. Regardless of whether a relationship is causal, a correlation allows prediction; thus such relationships are extremely useful. An extensive body of literature describes predictors of various kinds: to enhance learning conditions,

<sup>503</sup> Hall, M.J.B. (2000). What is the truth in the scale of the Japanese bank's bad debt? Is the situation manageable?, *Journal of Financial Services Research*, 17:1, pp. 69-91

<sup>504</sup> Zoubi, T.A., Al-Khazali, O. (2007). Empirical testing of the loss provisions of banks in the GCC region, *Managerial Finance*, vol. 33, No 7, pp. 500-511

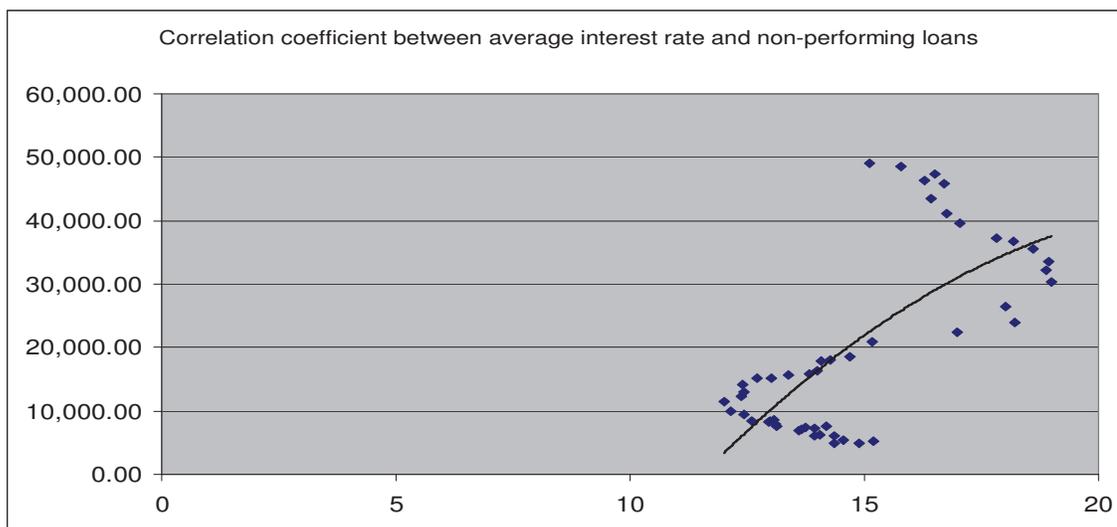
<sup>505</sup> Bandyopadhyay, A., Chherawala, T., Saha, A. (2007). Calibrating asset correlation for Indian corporate exposures: Implications for regulatory capital, *Journal of Risk Finance*, vol. 8, issue 4, pp. 330-348

to increase the effectiveness of teaching, to predict the stock market, to forecast college success. Unless the correlation is perfect, however, the predicted value is always less extreme - that is, closer to its mean - than the value from which it was predicted (Krathwohl, 1998). Our study is based on the real data, extracted from the annual reports published by the National Bank of Romania and the Monthly Bulletins from the mentioned period. We obtain in the case of the active banks from Romania, the following results for the Pearson correlation coefficient between average interest rate and non-performing rate.

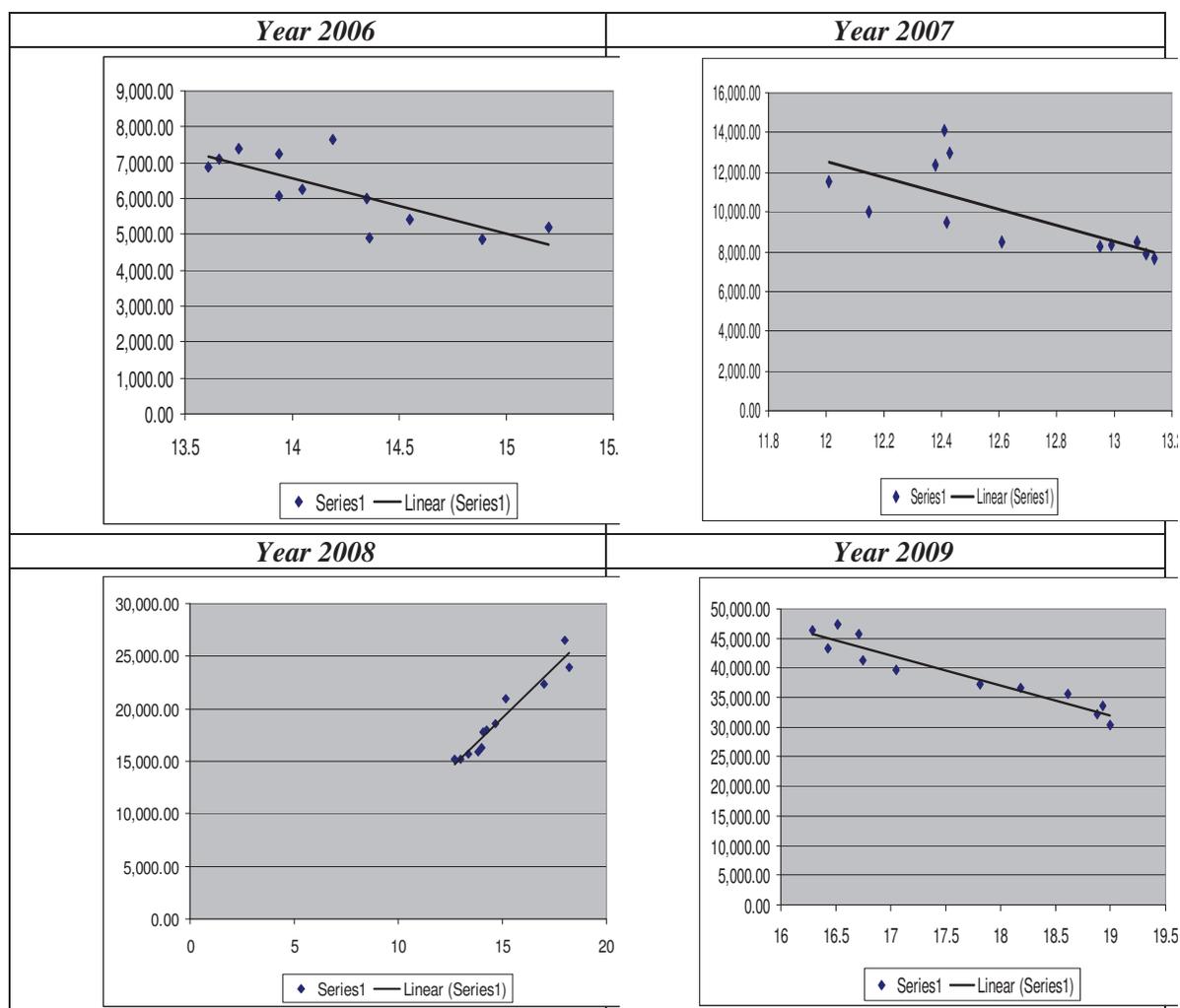
**Table no. 1 – The Pearson correlation coefficient between average interest rate and non-performing rate from Romania**

<i>Year</i>	<i>The Pearson correlation coefficient</i>
2006	-0.76
2007	-0.71
2008	0.97
2009	-0.95
2010	-1

**Figure no. 1 - Correlation coefficient between average interest rate and non-performing loans at the level of Romanian banking system during 2006-January 2010**



**Figure no. 2 – Annual Correlation coefficient between average interest rate and non-performing loans at the level of Romanian banking system**



#### 4. Conclusions

In 2006 and 2007, the values of the Pearson coefficient correlation show a connection between variables. We suggest that there is an inverse correlation between the average interest active rate (cause variable) and the value of the non-performing loans (effect variable). In these conditions, we identify the others conditions that affect the debt service of the borrowers. The lack of banking settlements and regulation, in the mentioned period the primary banking legislation was improper<sup>506</sup>. Since 1<sup>st</sup> of January 2007, the new banking legislation<sup>507</sup> lays down the principles concerning the taking up and pursuit of the business of credit institutions and financial investment companies within Romania's territory and their prudential supervision, as well as supervision of payment systems and financial instruments settlement systems.

During 2008-2010 (February), the different values of the Pearson correlation coefficient were obtained. The values very close to +/-1 show a direct and strong connection between variables.

<sup>506</sup> Law no. 58/1998 on the banking activity, republished in Official Gazette of Romania no. 78/2005, as subsequently amended and supplemented

<sup>507</sup> Emergency Ordinance no. 99/2006 on Credit Institutions and Capital Adequacy Published in Official Gazette of Romania, no. 1027/2006

We also suggest that there is an inverse correlation between variables, explained by the following causes: the fall of the prices of the loan collaterals, especially real estate; inflation pressure that contribute to the growing of the non-performing loans; unemployment and economic contraction.

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