

INTEGRATION OF MACROECONOMIC VARIABLES IN THE ANALYSIS OF CREDIT RISK AND THE IMPACT ON THE RATE OF RETURN OF COMPANIES AND THE DEGREE OF CORPORATE INDEBTEDNESS

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ABSTRACT

The credit risk management is an important component of the activity of credit institutions, and an increased supervision is mainly done through credit portfolios.

The research offers a perspective on the quantification of non-performing loan rate within the Romanian banking system. The results obtained showed that the strongest impact is that of the EUR/RON exchange rate, however, neither the influence of the impaired receivable rate in the total assets of credit institutions nor the monetary policy interest rate are to be neglected.

The presented model aims to define the relationship between the quality of credit portfolios and the macroeconomic environment in Romania. In this respect, 25 annual observations were analysed, the reviewed period of time being 2015 - 2019.

KEYWORDS: *degree of indebtedness, exchange rate, interest rate, non-performing loan rate, risk*

1. INTRODUCTION

Given the macroeconomic evolution in recent years and the impact on the credit portfolios of financial institutions, it has been noticed an increased interest in the risk management and in early warning systems. Risk management is an important element in the activity of the credit institutions, banks giving a high importance to the quality of the loan portfolios to the detriment of their volumes. In the 2005 - 2008 boom years, the financial institutions adopted a policy of aggressive growth of the market share, based on providing a simplistic system of analysis of loans and on products that encouraged the speculative transactions.

This study aims to define a framework for highlighting some macroeconomic influences on the non-performing loan rate. The paper addresses two main aspects: the determinants of the non-performing loan rate and the influence of the economic environment. In order to understand the impact of non-performing loans on the share capital of financial institutions, the paper analyses the macroeconomic conditions through the following variables: the rate of return on basic activity, the monetary policy interest rate, the degree of corporate indebtedness, the EUR/RON exchange rate. In this sense, a number of 25 observations from the period 2015-2019 were tested, the research methodology being based on the analysis and interpretation of statistical results.

The Romanian market was selected for analysis because the economy is not in the Euro area, but it is an emerging economy depending on the external investments, and the local market has shown an increase in the volume of loans during the periods of economic growth.

The empirical analysis aims to explain the influence that the independent variables have on the non-performing loan rate (the dependent variable). Also, the purpose of the paper is to obtain a functional form for determining the future values that can be recorded for the non-performing loan rate.

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2.2. Sample and Data Collection

This study assesses the impact of macroeconomic indicators on the deterioration of the loan portfolio.

The analysis concerns data with annual frequency from the period 2015 to 2019, available on the National Bank of Romania’s website.

For the purpose of the research, we used:

- *Dependent variable* - Y, “non-performing loan rate” according to the definition by EBA (European Banking Authority), as it appears under the aggregate indicators regarding the credit institutions listed on the National Bank of Romania’s website, expressed as a ratio between the non-performing exposures of loans and advances and the exposures of loans and advances. Exposures are considered to be non-performing and the debtor is considered insolvent when: 1) are significant exposures that are more than 90 days past due; 2) it is considered that, in the absence of the execution of the real guarantee, it is unlikely that the debtor will pay in full the obligations from the loans, regardless of the existence of any outstanding amount or the number of days of payment delay.
- *Independent variables*:
 - Rate of return on basic activity – X₁
 - Monetary policy interest rate – X₂
 - Impaired receivable rate in the total assets of credit institutions – X₃
 - EUR/RON exchange rate – X₄

The data subject to the analysis are presented in Table no.1.

Table 1. Database with the values of the main variables

Year	Rate of return on basic activity	Monetary policy interest rate	Impaired receivable rate in the total assets of credit institutions	EUR/RON exchange rate	Non-performing loan rate according to the definition by EBA
	X ₁	X ₂	X ₃	X ₄	Y
2015	1.7131	0.0175	0.0385	4.5245	0.1351
2016	1.8857	0.0175	0.0267	4.5411	0.0962
2017	1.8162	0.0175	0.0164	4.6597	0.0641
2018	1.8807	0.0250	0.0196	4.6639	0.0496
2019	1.8544	0.0250	0.0167	4.7793	0.0408

Source: <http://www.bnr.ro>

It is envisaged that the relationship between the selected variables and the degree of indebtedness will be clear and economically viable, respectively the relationship between each of the variables: the rate of return on basic activity and the non-performing loan rate will be inversely proportional, respectively an increase in this indicator to determine a reduction in the non-performing loan rate, while the relationship between the monetary policy interest rate, the impaired receivable rate in the total assets of credit institutions, the EUR/RON exchange rate and the non-performing loan rate will be directly proportional, an increase in these indicators involving a higher non-performing loan rate.

2.3. Data Analysis

In order to study the impact of the evolution of macroeconomic indicators on the non-performing loan rate, equations were used to determine the credit risk based on the variables under research.

Data analysis and research results were obtained with the help of the Excel software package, the econometric analysis being performed on logarithmic series to facilitate the interpretation of the results.

Hypothesis:

The research starts from the hypothesis: “Can credit risk be anticipated depending on the evolution of macroeconomic variables?”

The coefficient of the independent variable shows how much the dependent variable Y_t changes when the independent variable X_{jt} changes with one unit, provided that the other independent variables remain constant.

For the purpose of the analysis, empirical correlations were made between the variables, in order to reflect the degree of influence of each independent variable on the dependent variable.

The correlation matrix of the analysed variables (Table 2) shows that the high values of the non-performing loan rate (Y) are associated with an increase in the impaired receivable rate in the total assets of credit institutions (X_3), a fact evidenced by the positive value of the correlation between the two variables.

On the other hand, the negative values of the correlation between the non-performing loan rate (Y) and the rate of return on basic activity (X_1), the monetary policy interest rate (X_2) and the EUR/RON exchange rate (X_4) show that the reduction in the independent variables is associated with a low non-performing loan rate.

Table 2. Correlation matrix of the analysed variables

	Rate of return on basic activity	Monetary policy interest rate	Impaired receivable rate in the total assets of credit institutions	EUR/RON exchange rate	Non-performing loan rate according to the definition by EBA
Rate of return on basic activity	1				
Monetary policy interest rate	0.483079991	1			
Impaired receivable rate in the total assets of credit institutions	-0.623437627	-0.527063461	1		
EUR/RON exchange rate	0.427870436	0.771039964	-0.867377353	1	
Non-performing loan rate according to the definition by EBA	-0.646259343	-0.82885137	0.910898947	-0.950536267	1

Source: author processing

The estimation of the regression model in Excel highlighted the multiple correlations between the variables, which shows that there is a very strong relationship between the non-performing credit ratio and the macroeconomic variables under analysis (Table 03).

Table 3. Estimation of the regression model

	Rate of return on basic activity	Monetary policy interest rate	Impaired receivable rate in the total assets of credit institutions	EUR/RON exchange rate
SUMMARY OUTPUT				
<i>Regression Statistics</i>				
Multiple R	0.646259343	0.82885137	0.910898947	0.950536267
R Square	0.417651138	0.686994593	0.829736892	0.903519195
Adjusted R Square	0.223534851	0.582659458	0.772982523	0.871358926
Standard Error	0.42971221	0.315037316	0.232351969	0.174906737
Observations	5	5	5	5

Source: author processing

By analysing the obtained results, we notice that the non-performing loan rate is more than 90% influenced by the variation in the EUR/RON exchange rate (R Square = 0.903519195). A significant influence on the non-performing loan rate is also that of the impaired receivable rate in the total assets of credit institutions (82.97%), while the rate of return on basic activity and the monetary policy interest rate influence the non-performing loan rate to a lesser extent (41.76% respectively 68.70%).

The values of the statistical tests highlight the econometric performance of the obtained model, and the data set used allows the verification of the correlation of the coefficients and observes the significance threshold (the probability associated with the *t* test is lower than the most restrictive level of relevance of 1%, and the probability associated with the *F* test shows that at least one of the regression coefficients is statistically significant).

Next, we performed the analysis of the data series using the Excel software to determine the correlation between the non-performing loan rate and the independent variables under analysis, the result of the analysis being presented in Table 4.

Table 4. Research results in relation to the independent variables

Variables under analysis	Coefficient	Std. Error
Intercept	2.68502272	5.442352668
Rate of return on basic activity	-0.78041753	3.291223793
Monetary policy interest rate	-0.974224854	0.806303924
Impaired receivable rate in the total assets of credit institutions	0.683501543	0.320573015
EUR/RON exchange rate	-0.96269041	3.90445902

Source: author processing

Thus, the estimated model is the following:

$$Y = 2.68502272 - 0.78041753 * X_1 - 0.974224854 * X_2 + 0.683501543 * X_3 - 0.96269041 * X_4$$

Given that the dependent variable and the independent variables are expressed in natural logarithms, the coefficients of the independent variables show how much the dependent variable changes with 1 percent change in the independent variables. Thus, an increase of 1% in the rate of return on basic activity will lead to a decrease in the non-performing loan rate by 78.04%. Also, the 1 percent increase in the impaired receivable rate in the total assets of credit institutions will determine the increase in the non-performing loan rate by 68.35%, while reducing the monetary policy interest

rate and the exchange rate will cause the decrease in the non-performing loan rate by 97.42% and 96.27% respectively.

An important motivation in the choice of variables is related to their representativeness, since they illustrate the financial market (the rate of return on basic activity, the monetary policy interest rate, the impaired receivable rate in the total assets of credit institutions, the EUR/RON exchange rate), as well as to the fact that it illustrates the health of the financial system (the non-performing loan rate).

The data mentioned in this study were collected from the statistical reports of the National Bank of Romania, and the statistical tests and analyses performed are in the possession of the author, being available for reference.

3. CONCLUSIONS

The credit risk is one of the most important risks a bank is facing, which is why in recent years there has been a focus on adopting banking business models, in order to allow financial institutions to develop an effective risk assessment framework, without jeopardizing the rate of return.

The econometric results of this study suggest that the monetary factors influence the evolution of the non-performing loan rate. The impulse-response function is used to study the evolution of the dependent variable after a shock is applied to the independent variables. Thus, it was found that the depreciation in the socio-economic indicators causes the increase in the non-performing loan rate. Banks need to identify and assess the degree of risk that accompanies each loan application, and where the risk is high, it will reflect on the lending conditions (high interest rate).

The paper aims to both a statistical study and a qualitative study. The main result of the qualitative analysis is to highlight the influence of the non-performing loan rate on the capital that supports the activity of a bank. A loss arising from a non-performing loan is indirectly translated into a capital shortfall through provisions, write-offs and de-recognition. Throughout the post-crisis years, we have noticed continuous actions of recapitalization in the banking environment carried out through bail-out, bail-in, capital infusion from shareholders or new stock sales.

The motivation for the capital increases lies in the increase in the credit risk due to the non-performing loans and the recognition of the loss, but also because of the inefficient restructuring actions.

There is an indirect influence of the credit risk ratio on capital, noting that an increase in the non-performing loan ratio implies a higher stock of provisions specific to credit risk, being reflected by an expense in the Balance Sheet and a loss in the Income (Profit and Loss) Statement and in available capital.

The scientific novelty of the research stands in conducting a study on the operational risk in the Romanian banking system by highlighting the main aggregate indicators of the credit institutions listed on the website of the Romanian National Bank (the Central Bank of Romania). The novelty within this study is the integrative perspective of risk management techniques depending on the aggregate indicators of credit institutions and the ways to improve performance, with the purpose of highlighting the causes and the impact of the legal framework of the new prudential requirements and of various endogenous and exogenous factors on the financial results obtained by Romanian banking system overall. Moreover, I consider that there is current interest in the scientific approach stemming from the intermingling of the macro-prudential and micro-prudential levels.

The results of this study have both practical applicability and implications in macroeconomic policies, showing the effects of manifestation of non-performing loans through the deterioration of the macroeconomic environment. We believe that the effects of the deterioration of the credit portfolio of commercial banks could be reduced, given that banking prudence would be a more frequent topic on the agenda of macro-prudential regulations. Growing portfolios without a solid basis, under conditions of relaxation of lending regulations, is no longer an important endpoint in the strategy of banks, but rather a prudent growth is desired, based on well-documented rules and

practices. Following the study developed in this article, a related analysis will consider identifying a causal relationship between the macroeconomic variables and the capital of financial institutions.

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