MACRO-ECONOMIC VARIABLES INFLUENCE OVER THE CREDIT RISK IN ROMANIAN BANKING SYSTEM

Andrei Florin, PhD Candidate, Bucharest University of Economic Studies

Abstract: Given the macro-economic evolution of the past 4-5 years and their impact in the credit portfolios of the financial institutions, an increased interest is shown in regard to risk management and early warning systems. As we see the risk management will represent an important item in the organization of the credit institutions and an increased supervision will be made over the quality of the credit portfolios instead of the volumes.The research paper offers a perspective for the quantification of credit risk over the Romanian banking system illustrated by the VAR model analysis and review. By analyzing the results of the VAR model it was observed that the most powerful influence is made by the exchange, interest and unemployment rates. The GDP influence as demonstrated by the model is influencing the credit risk rate less than the other variables. The statistical test and outputs from Eviews software demonstrates the influence of the variables mentioned.The model presented has the scope to define the interactions between the quality of the credit portfolios and the macroeconomic environment from Romania. Having in view the complexity of the data aggregation and their availability, it were used 155 quarterly observations, the sample period being January 2001 - September 2013.Empirical analysis revealed an important influence of the macro-economic variables over the credit risk rate. The most significant influence is made by the exchange rate which confirms the deterioration of the credit portfolios under the big volumes of loans granted in foreign currencies.

Keywords: credit, risk, interest, unemployment, model.

Introduction

The research aims to define a framework in order to uncover some macroeconomic influences over the credit risk rate/NPL. The working methodology is based on statistical analysis and interpretation of results.

The paper addresses two main issues: the determinants of the credit risk rate and the influence of the economic environment performance.

Given the macro-economic evolution of the past 4-5 years and their impact in the credit portfolios of the financial institutions, an increased interest is shown in regard to risk management and early warning systems. The risk management will represent an important subject for the credit institutions and an increased supervision will be made over the quality of the credit portfolios instead of the volumes. Financial institutions assumed an aggressive growth policy of market share, based on enabling an easily credit analysis system and products that encouraged the speculative transactions. Such examples can be underlined in Romanian banking system but not only.

The approach on Romanian market was used because of the fact that the economy is not in the Eurozone area, is an emergent economy depending on the external investments and the local market showed a good increase of loan volumes in economic growth periods. The empirical analysis aims to explain the influence to which the independent variables have to credit risk rate (dependent variable). Also, the research paper envisages obtaining a functional form for determining the future values that can be recorded for the credit risk rate. Credit risk rate was preferred instead of NPL rate (Non-Performing Loans) because the latter is calculated only starting with September, 2009.

I. Macro-economic methodologies in regard to credit risk quantification models

Methodological solutions used for measuring the impact of macro-economic conditions over the reimbursement capacity of the debtors rely in multiplying the set of explanatory variables for the scoring model with aggregated indicators (Bunn and Redwood, 2003; Antunes et al., 2005). Also, the connection functions can be used for modeling the dynamics of some balance sheet items of the debtor through equations, including macro-economic variables(Bunn and Redwood, 2003; Antunes et al., 2005).

In regard to credit risk scorecards, the methodological solutions should be developed using multiple regressions with macroeconomic factors. In this context, the dependent variable is the NPL rate or the credit risk rate (Hoggarth and Whitley, 2003; Pain, 2003; Dermine & Neto de Carvalho, 2008), the common econometric techniques used being the regressions and VAR models (Jorda, 2005; Drehmann et al, 2006; Jimenez & Mencia, 2007).

Specific literature focused on explaining the influence of the macroeconomic performances in credit risk and non-performing loans rate. The economists Dash and Kabra (2010) provide a more detailed review of this topic.

A study made by Louzis, Vouldis and Metaxas (2010) on the 9th largest Greek banks, analyzing the NPL divided by different types of loans (consumer, mortgages, corporate) revealed that the indicator is explained by the management quality and macroeconomic fundamentals. Also, some other conclusions were related to the positive correlation between NPL and real lending rates, un-efficient management and higher proportion between operating expenses and incomes. Same results were also obtained by Espinosa and Prasad (Espinoza & Prasad, 2010) in a working paper referring to nonperforming loans and their macroeconomic effects.

The literature that pertains best with the analysis from the paper is focused on explianing and predicting the credit risk rate at a macro level using the aggregate credit risk values. These values can refer to the total outstanding loans from the economy or only to specific types.

Michael Boss (Financial Stability Report, 2002) applies the methodological solution described above, in order to model the sectorial dependencies of credit risk rate in Austrian economy, for exposures belonging to non-financial companies and also to exposures to private individuals.

Virolainen (2004) applies the dynamics models for credit risk for Finland, by utilizing macro-economic variables like: economic growth rate, interest rate for a tenor above 1 year, corporate indebtedness. Unlike the other research papers, the sensibility analyses performed for the credit portfolios granted to companies is divided in six types of activities.

Roberta Fiori and Simonetta Iannotti (2009) targets the analysis of the impact in which the economic image of Italy affects the evolution of credit risk rate triggered by exposures of non-financial companies divided by types of activity sector in eight categories. The methodology for analysis is based on the approach used by Wilson (1997) and the further developments projected by Virolainen (2004), while the evaluation of the operational form between the empiric values of the default rates at sector level and the macroeconomic environment is made through the SUR method.

IMF (International Monetary Fund) recommends that loans and other assets to be classified as non-performing when the installments registers overdue for more than 90 days. Moreover, non-performing loans will include also the loans with a debt service less than 90 days when a clear indication for default exists, e.g.: bankruptcy, insolvency.

Moody's (Investors Service "Moody's Approach to Analyzing And Rating Emerging Market Banking Systems: Argentina as a Case Study") rating agency considers a loan as non-performing in the following situation: for consumer loans granted to individuals if the

overdue term is greater than 60 days; for commercial loans and leasing if the overdue amount is greater than 90 days; any loan to which there is a clear indication of default.

In the international practice, based on Bank for International Settlements requirements, there are several approaches, synthesized in the below table, based on the applied criteria:

Table no.1 – Criteria used for determining the NPL loans

Criteria	Countries and allocation
Number of overdue days	>90 days: 12 countries (Romania, Bulgaria, Cyprus, Greece, FYR Macedonia, Serbia, Hungary, Poland, Czech Republic, Ukraine, Latvia, Austria) >60 days: 2 countries (Estonia, Lithuania) >30 days: 1 country (Russia: >30 days for companies and >60 days for individuals)
Legal proceedings	All 15 countries mentioned
Financial performance	
Contamination at debtor level	Yes: 10 countries (Romania, Bulgaria, Serbia, Hungary, Czech Republic, Russia, Estonia, Latvia, Cyprus No: 4 countries (Greece, Poland, Lithuania, Austria) N/A: 1 country: FYR Macedonia

(Source: IMF, NBR)

The classification of loans recognized as NPL's is made through the following categories in the analyzed countries (Popa, 2009): Loss: 2 countries (Romania and Bulgaria); Doubtful and loss: 4 countries (Serbia, Ukraine, FYR Macedonia, Russia); Sub-Standard, doubtful and loss: 3 countries (Hungary, Poland, Czech Republic). The other countries not mentioned above do not classify the loans as NPL's based on the classification category.

IFRS, IAS 39 - Financial Instruments: Recognition and Measurement outlines the requirements for the recognition and measurement of financial assets, financial liabilities, and some contracts to buy or sell non-financial items. Financial instruments are initially recognised when an entity becomes a party to the contractual provisions of the instrument, and are classified into various categories depending upon the type of instrument, which then determines the subsequent measurement of the instrument (typically amortised cost or fair value). Special rules apply to embedded derivatives and hedging instruments. A financial asset or a group of financial assets is considered as impaired if: there are evidences of depreciation as a result of a event that occurred after the initial recognition of the asset; the event that generates loss has an impact over the future cash flows estimated for the financial asset that can be estimated reliably.

The following examples represent events that generate losses: financial difficulties of the debtor; breach of contract (overdue in paying the principal/interest); impending insolvency/bankruptcy.

In order to quantify the credit risk, National Bank of Romania uses two core indicators: credit risk rate and non-performing rate. The first indicator is defined as the ratio between the gross exposure of the non-banking loans classified as loss or doubtful and the total amount of loans classified, non-banking loans, excluding off balance sheet items. The second indicator, NPL rate, is defined as the ratio between gross exposure related to the non-banking loans classified in "loss 2" (pierdere 2) with a debt service over 90 days and/or to which the legal proceedings were started and the amount of loans classified, non-banking loans, excluding off balance sheet items. The difference between the two indicators is that

credit risk rate comprises also the doubtful and loss 1 classified loans as against NPL rate which takes into account only loans classified in loss 2 and/or with legal proceedings.

According to the regulations in force, in Romania, all gross exposures which registers overdue amounts for more than 90 days or/and to which legal proceedings were initiated are classified in loss 2 category and fully provisioned after a haircut of maximum 25%. This criterion of classification is significantly more severe than the criteria's used in other countries. Steven van Groningen, CEO of Raiffeisen Bank, wrote on a blog post about this discrepancy in regard to the non-performing loans methodology of calculation and the difference in comparing the numbers within other countries from European Union.

II. Data's used in analysis

The following variables were used in the empirical analysis: credit risk rate for the end of each quarter; unemployment for the end of each quarter; mean interest rate used by credit institution in lending for the end of each quarter, hereinafter named as interest rate; GDP in market prices (2005 = 100, seasonally adjusted data) and mean quarterly exchange rate EUR/RON, hereinafter named as exchange rate. The observation period for variables analyzed is January 2001 – September 2013, 51 quarterly observations.

The dependent variable is considered the credit risk rate. Independent variables taken into consideration are: unemployment rate, exchange rate, GDP and interest rate. GDP was taken into account as according to the economic theory, the credit risk rate depends on the economic cycles. The reason for selecting the other the variables (interest rate, exchange rate and unemployment) was due to the fact that these were the most sensitive indicators as shown in the specific literature. All the econometric test and analysis performed are available within the author.

III. Aspects revealed through the statistical analysis

In order to check the economic assumptions that were presented above it was used a VAR model. The advantage in using the VAR model is that is simple, it does not imply severe restrictions for the variables and it can be used in many other purposes (analyze, Impulse Response Functions, forecasting). The weakness of this model is expressed by the fact that is not a theoretic model; Choleski decomposition for the estimation of the parameters is not always well-matched with the economic theory.

The number of lags used was chose after an analysis has been performed, VAR Lag order selection criteria. A higher number of lags was choose, 4 in this case, because an impairment of the macro indicators (decrease of GDP, raise of unemployment) it is not immediately reflected in the credit risk rate growth, a gap being observed. Also, a test for the possible co-integration relations between the selected variables was conducted. In this case a relative small co-integration relation was observed but VAR model was preferred for use. The stability test performed shows that VAR model applied over the equation satisfies the stability condition. Homoscedasticity was tested through White test which showed that the hypothesis is respected.

Impulse – response test allows the observation of a shock over the evolution of the dependent variable. Variance decomposition shows how a variable can explain the evolution of another variable. The period under the subject was chose as 10 quarters and the residual was defined as one standard deviation because of the fact that the variables have different units of measurement.

The interpretation of the four graphics from VAR model presented in the Annex can be summarized as follows: impairment of the macro-economic indicators determines the growth of the credit risk rate as represented in the above graphics, result in compliance with the economic theory. As the first graphic shows, a shock over GDP determines a decrease of

credit risk rate in the first two quarters, a raise in the next five and after the trend is stabilizing. According with the second graphic a depreciation of the national currency against the EURO determines an increase of the credit risk rate in the first 7 quarters and after that following a descendent trend. This happened because of the amount of credits from Romanian economy denominated in foreign currency. The third graphic shows an increase in credit risk rate when the interest rate increases. This can happen also as a result of the increase of the National Bank interest rate done in order to stabilize the inflation pressures. We can observe that it is possible when the interest rate is increased in order to lower the inflation, the financial stability of the monetary and banking system can be affected as the credit risk rate could rise. The fourth graphic shows the influence of the unemployment in the credit risk rate. In the first three quarters there is a small increase and after a decrease in the fourth period but the rising trend continues starting with quarter and a slow stabilization.

Conclusions

The recent global financial crisis offers a very good example of rising NPL and credit risk rate. A close examination determines the influence of the macroeconomic performances. The analysis performed examines the aggregate NPL and credit risk rates and macroeconomic data.

The VAR model presented is developed in order to define the interactions between the quality of the credit portfolios and the macroeconomic environment from Romania. As illustrated, by VAR model used, the biggest influence on credit risk belongs to the exchange rate because of the big amounts of loans denominated in foreign currency. Interest rate and unemployment have also an influence over the credit risk, but lower than the one of exchange rate. GDP does not have a significant influence over the credit risk as described in the model.

Findings revealed by the research paper have both practical applicability and economic policy implications. The results and econometric relations issued by this research can be used for stress testing and forecasting purposes by regulatory and supervisory institutions and also by the banks.

Analyzing the macro-economic performances form the last five years it was revealed a high importance raised in regard to the risk management systems, both from internal perspective (bank level) and also from regulatory and prudential perspective (supervisory level, National Bank of Romania). NBR maintained over the economic growth cycles a prudential policy in regard to the banking supervision which led to a better perspective over the credit portfolios and NPL rate. In this way it was observed that the prudential policies and approaches followed by NBR had a positive role, proven by the fact that the solvency ratio was comfortable and in line with the agreed values within IMF.

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Annexes

Impulse Response Functions

Fig. 1 – Impulse Response Functions to GDP and Exchange rate

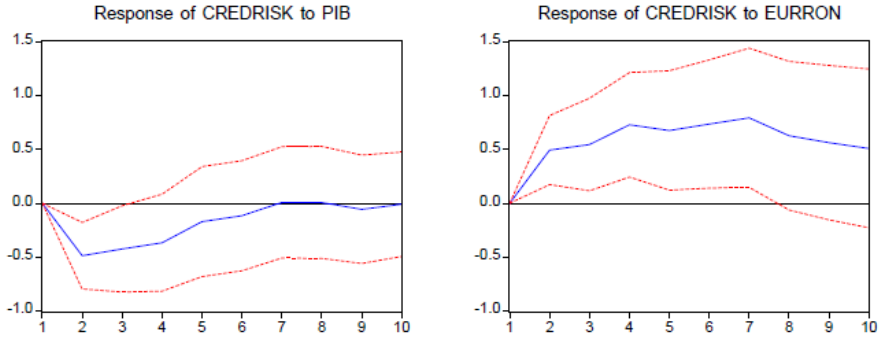
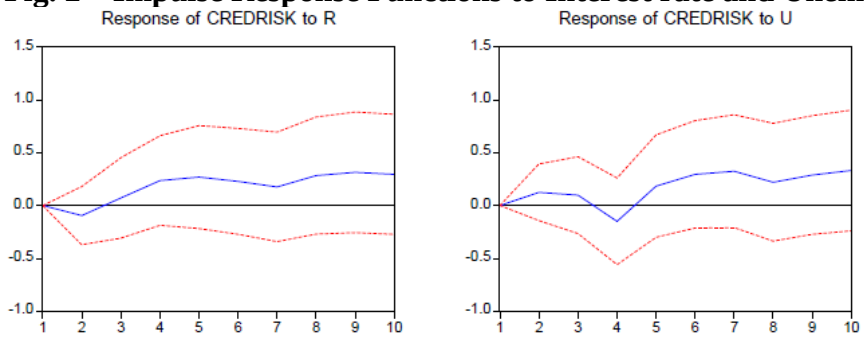


Fig. 2 – Impulse Response Functions to Interest rate and Unemployment



A note must be made regarding the graphics:
- blue line represents the Impulse Response Function;
- red line represents the confidence level;
- vertical axis: standard deviation, measurement unit of the graphic;
- horizontal axis: the period taken into account in analysis, 10 quarters in this exercise.