

Non-performing loans decision making in the Romanian banking system

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Abstract. *Non-Performing Loans (NPLs) are representing nowadays one of the main challenges for the banking systems all over the world. Therefore, a sustainable decision-making process should be implemented, for minimizing the effects of credit risk. The current paper uses a dynamic panel regression model to present the determinants of NPLs for the largest five banks of the Romanian Banking System during 2007-2016. A Generalized Method of Moments (GMM) regression is used and defined under three different types of variables: bank specific indicators, macroeconomic indicators and qualitative variables. Other studies illustrated also the determinants of NPLs in various banking systems from all around the world, such as Japan, China or several CEE countries (especially the emergent ones). After an in-depth analysis of the literature and Romanian market, the following variables were found to be relevant and were introduced into a dynamic data panel model: unemployment rate, annual average growth rate of gross domestic product, return on equity (ROE), loan to deposit ratio (LTD). The existing literature presents ROE as having a negative impact on NPLs, unemployment rate being positive correlated with NPLs and a negative relationship between economic growth and such loans. Our contribution to the current literature is represented by the introduction of two additional qualitative variables (Board Risk Management Ratio (BRMR), as the proportion of risk managers within the Board of Directors of each bank in question and the Expert Aggregate Priority Vector (EAPV), as the aggregated perceived risk regarding the NPLs). The decision of introducing these variables relies on previous research made in this area, results being validated by experts from the Romanian Banking System, according to the BASEL III and NBR criteria. The results of the current paper are consistent with the existent literature, the correlations and impact of the variables being relevant for the subject matter.*

Keywords: Non-performing loans, decisional processes, banking performance, risk evaluation, Analytic Hierarchy Process (AHP), Generalized Method of Moments, dynamic panel data model.

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Introduction

While every company is striving for excellence, looking for increasing performance and achieving success, there can be said that there are a lot of factors and variables that could alter this continuous path for improvement. Almost every organization is searching for the optimum mix of activity, in the quest of maximizing profits, minimizing costs and investing in their most important asset, the human resources. However, the extent to which they succeed in their initiatives involves a series of decisions that are merely easy to take. Some

of them are taken by managers guided by intuition and guts; others are represented by experience; some others are relying on the costs' analysis, on profits or on several other relevant indicators for the field in question. But all of them have one particular element in common, respectively the associated risk that derives from taking the decision.

In the banking sector, risks are representing a very important variable for both, the supplier of products and services (the bank) and the client (any natural or legal person who uses the products and services of the bank). Therefore, the risk management sector provides very important data in front of the decision maker, which can lead to some great opportunities or threats for the bank. Similar, the client should analyze very well the offers from the banking sector, in order to assess very well the risk exposure of every offer from the banks' portfolios.

Starting from these generally acknowledged principles of associated risks and from the need of every bank to continuously improve the sustainability of their portfolios, Răduțu and Pop analyzed in 2016 the opinion of the decision-makers experts from the Risk Management departments within the Romanian banking sector, regarding the importance of the main types of risks. Using an MCDM (multi-criteria decision-making) approach, by constructing an AHP model with the experts from several banks of Romania, specialized in risk management, they individually questioned every specialist, obtaining a consensus in decisions and validating the decision model, composed by several aggregated indicators, established and agreed by NBR. Thus, the most important category of banking risk is by far the credit risk (over 60%), followed by the liquidity risk (around 30%), while the market, operational and systemic risks scored a combined value of under 10%.

Having these conclusions validated, the authors wanted to go deeper into the analysis and pursued another objective: the decrease of banking risk, while considering the optimum allocation of their resources. In this concern, they designed a new AHP model, built on the results of the previous research and using the expertise of the same pool of specialists, they analyzed their decisions regarding the optimization of assets portfolios, by targeting the optimum capital allocation which should be done by reducing the risks associated with the highest perceived ones. Following the same AHP methodology, the experts' perceived importance regarding the decreasing of risk (denominated in the model below as EAPV) of the most high-risk balance sheet elements of the banks were the following: non-performing loans with 22.57%, followed by restructured loans (12.53%) and by subordinated borrowings with 6.78%. Next, by aggregating the experts' input with the capital allocation from the model, considering the requirements of BASEL III and NBR, the top most important budget allocation should have been in 2014 the non-performing loans (20 million EUR), restructured loans (around 11 million EUR) and the consumer loans (3.66 million EUR) (Pop and Răduțu, 2016).

Non – Performing Loans (NPLs) have an important role for banking stability and efficiency in the last decade. NPLs ratio became an important measurement key of credit risk and because this risk is the most powerful in banking sector, we can say that this ratio is crucial for establishing the profitability vs. risk in this area. Because the impact of it in emerging markets could be greater than in developed countries, we decided to analyze the determinant of non-performing loans in this category of countries.

In addition, if we consider the correlation between the associated risks – management decisions – non-performing loans or capital allocation, one should emphasize also on the impact of the human resources policies into the operational and strategic decisions.

Romanian banking sector is chosen because of its history, built on old state-owned banks which were sold to large international banking group such as Erste, Societe Generale, ING, Raiffeisen and the list may continue. One of the characteristics of this kind of banking system is a rather high level of non-performing loans. This hypothesis is validated by Louzis et al. (2012), where they treated the Greek banking sector and explained this typology. Our motivation of making a study for the evolution of NPLs in Romania is correlated also with the ownership concentration, which is really high and also with the fact that the Romanian banking system is rather a “young” system, with less than 30 years of activity. Most of the banks had an aggressive strategy of lending because they aspired to achieving market share after buying previously state-owned banks. For this aim, they reduced customers' creditworthiness and added clients from B to D categories to their portfolio. Since the last financial crises, one of the Romanian banks' concerns has been represented by the improvement of their portfolio and by cutting down the credit risk. Therefore, non-performing loans became an important asset to be followed and adjusted for respecting the banks' objective.

As briefly mentioned in the abstract, the aim of this article is to determine, based on previous research of the authors, the determinants of NPLs, their influence and correlations with a series of quantitative and qualitative variables that every bank portfolio analysis should take into consideration. The following sections will introduce, detail and explain three types of variables that could alter the value of NPLs: bank specific, country specific and qualitative factors. The proposed model, structured in a panel data in Eviews, also presents the contribution of the authors, as value added from the previous two researches, respectively two aggregated variables (BRMR and EAPV). Their influence relies on the results of the previous research of the authors, validated by the experts from the Romanian banking system, according to the BASEL III and NBR criteria, within the AHP models.

The rest of the paper is organized as follows. Section 1 is the presentation of the existing literature related to our topic. Section 2 is dedicated to Data description and explains the information used in the model. Section 3 defines the methodology and makes an introduction of GMM. Section 4 presents the results of our models and the economic implications on Romanian Banking system. The next section is dedicated to conclusions and at the end of this paper you can find the references of this research.

Literature review

Plenty of papers examine the impact of non-performing loans in different banking systems or they are trying to explain the determinants of this kind of loans. Chortareas et al. (2016) use panel data on banking sector to examine the effects of banking supervisory architecture on central bank preferences. They used a dynamic panel data model to measure the conservatism of central banks, explained by separation, control variables such as macroeconomic conditions, monetary policy institutional design. The dataset is based on 35 economies from 1999 to 2010 and the data of separation variable is taken from Bank Regulation and Supervision Surveys (2001, 2003, 2007 and 2012). The last variable is a dummy with value 0, if the central bank is involved in banking supervision, or 1 if not. They tested the results by splitting the exchange rates regimes in two: fixed and floating. The results of this research present the separation variable as positive and statistically

significant and this explains that central banks having only monetary policy as focus tend to be more inflation averse, than the other ones with the supervision function. Barseghyan (2010) tried to identify the impact of non-performing loans and delay of government bailouts on Japan's economy slowdown during the 1990s and 2000s. The model in which the government pays deposit insurance to the financial sector reflects the following results: the existence of non-performing loans combined with a delay in the bailout determines a decline in economic activity. This decline is not only a fall in investment, but also one in labor and total factor productivity.

Erdoğan and Abazi (2014) use European emerging countries to explain how non-performing loans affected the economies in the last global crisis. Their quantitative study was applied to 20 emerging countries around Europe and the period analyzed is 2000 – 2011. Their results explained that the NPLs dynamics have been sensitive to GDP growth rate, inflation, but at the same time, an important role was played by the banking profitability expectations. They split the periods in three: pre-crisis, crisis period and post-crisis. The panel model used with fixed and random effects and one lag explains that rapid credit growth is a warning indicator of a NPLs positive trend, the inflation being a variable which affects the NPLs in a negative way. They recommended a strong macro-prudential regulation in the banking systems and they found no significant impact of bank-specific factors such as capital adequacy, liquidity, market concentration and the degree of foreign ownership. Nowadays, Romanian banking system is a foreign ownership one, because most of the banks are part of international groups, such as Raiffeisen Group, Erste Group, Societe Generale Group. In this case, the role of foreign ownership should be taken into account in our model. Zeng (2011) made an analysis of NPLs for Chinese banking sector. He used a utility function by following optimal control theory. The conclusions were: the Hamiltonian multiplier of the bank NPLs growth rate in the model was obtained using the negative derivative of the utility. This function was defined as loan function minus non-performing loan function. Another remark is that the model defines the equilibrium value of the saddle point of the bank NPLs. Another point to be mentioned is related to NPLs phenomenon in the Chinese banking sector. This is mainly significant in the state-owned banks. The last remark is: the equilibrium value of the bank NPLs is dependent on micro-economic factors, but is influenced by macro – economic variables.

Makri et al. (2014) studied the determinants of NPLs on Eurozone's banking systems for the period 2000-2008. Their model includes macroeconomic variables such as annual percentage growth rate of gross domestic product (GDP), public debt as percentage of gross domestic product (DEBT) and unemployment (UNEMP) and bank specific indicators like loans to deposit ratio (LTD), return on assets (ROA), return on equity (ROE). They applied a Generalized Method of the Moments (GMM difference) estimation and extended the model by using one lag for both bank-specific and macroeconomic regressors. The results reflected a strong correlation between NPLs and both macroeconomic and bank-specific variables. The following indicators are found significant: public debt, unemployment, annual average growth rate of gross domestic product, capital adequacy ratio, rate of non-performing loans of the previous year and return on equity. ROE was found to have a negative impact on NPLs, the level of NPLs from the previous year influencing the actual non-performing loans ratio in a positive matter. ROA, LTD, Government budget deficit or surplus as percentage of GDP (FISCAL) and INFL have not shown any significant impact on NPLs ratio to all model specifications. Macroeconomic

factors, such as UNEMP and DEBT, positively influence the NPLs ratio, but the relationship between GDP and NPLs was found as negative. Dimitrios et al. (2016) used a similar approach for finding the factors of NPLs in a Euro-area banking systems during the period 1990Q1-2015Q2. Only ROE_{it} and ROE_{it-1} from the bank-specific variables have been found significant in all models. FISCAL and DEBT have negative, but not significant coefficients as GROWTH and INFLRAT do in most models. $GROWTH_{t-1}$ was found to exert a significant impact. In addition, they introduced two more macroeconomic indicators. The first one is TAXINC and is expressed as % of GDP. As taxed (personal) income increases, disposable income and capacity to pay loans back are reduced. It significantly affects the quality of the loan portfolio. The second one, OUTPUT_GAP, has been theorized to incorporate the potential growth of an economy, thus reducing NPLs, while TAXINC was estimated to exert a strong (at 1%) positive influence.

Other studies conducted on the Romanian banking sector for listed companies such as TLV or BRD were made by Cepoi and Toma (2016) and Damian and Cepoi (2016). They were studying the volatility of the above-mentioned actions as well as the existence of informed agents on the market from an intraday perspective. We can link our findings with the values of the probability of informed trading on our capital market reported in above-mentioned papers.

The multi-criteria decision-making methodology related to the analysis of the NPLs is described by Sharifi and Otadi (2015), by classifying a series of 15 related peripheral factors from an Iranian bank into 3 main groups: bank network variables, country specific variables and the applicants' abilities and capacities. The degrees of importance and the solution to their research was modeled using an AHP model. Their conclusions revealed that the most important factors were considered to be the country specific ones, with over 55.20% (the top peripheral variable being „the difference between bank facilities rate and market interest rate”), followed by the bank specific factors (bank network) with 29.10% (the top peripheral variable being „the lack of a proper system for measuring credit of customers”), while the abilities and capacities of applicants were perceived to be the last ones with 15.70 % (the top peripheral factor being „the lack of implementing expert people and lack of staff evaluation system and staff job security and motivation instruments”). These illustrated results associate the performance of a bank with the need for a proper and sustainable decision-making system related the banking risk management, while having expertise and a very good staff evaluation policy.

Data description

We investigated which are the bank specific, macroeconomic and managerial qualitative indicators that are influencing the level of NPLs ratio. For this purpose, we have used annual banking data from Romanian banking system between 2007 and 2016. The banking data is coming from 5 banks and include both quantitative and qualitative variables. The banks have been chosen based on cumulated market share on system total assets. The accumulated market share of these banks is 59.09%. The data sources are Bankscope and manually extractions from banks' annually financial reports.

Table 1. Data Description

Country	Bank	NPL	TA (EUR mil)	ROE	LTD	SH	DR	TR	BRMR	EAPV	UNMPL	BD
ROMANIA	BCR	17.77%	16082.2226	4.78%	73.72%	1.00	83.81%	0.90	20.00%	22.57%	6.71%	-4.11%
ROMANIA	BT	10.25%	6885.8749	13.33%	70.68%	0.50	36.19%	1.00	14.28%	22.57%	6.71%	-4.11%
ROMANIA	BRD	13.67%	11324.1522	7.35%	87.37%	1.00	59.85%	1.00	11.11%	22.57%	6.71%	-4.11%
ROMANIA	RAIFFEISEN	7.64%	5836.4991	13.87%	77.79%	1.00	99.93%	1.00	28.57%	22.57%	6.71%	-4.11%
ROMANIA	UNICREDIT	10.56%	6071.3035	8.51%	136.51%	1.00	65.39%	0.30	12.50%	22.57%	6.71%	-4.11%

Source: World Bank, Banks Financial Report, 2007-2016.

The banking quantitative indicators are the following: total assets (TA), return on equity (ROE), loans to deposit ratio (LTD) and non-performing loans (NPL). NPL is the endogenous variable. Total assets (TA) is a measure of bank's side because it reflects the cumulated amounts of all investments (loans, derivatives, Property and equipment, intangible assets, cash and so on). The importance of TA in the evolution of NPLs is easy to understand because bigger banks are conducted by the "too – big – to - fail" (TBTF) hypothesis confirmed by Louzis et al. (2012). Large banks take excessive risks by increasing their leverage under the TBTF presumption and therefore have more NPLs. ROE is a performance indicator and from its formula we can understand that it is powerful to use it and find an impact of return rate of the equity on the level of non-performing loans. We are expecting a negative relationship between ROE and NPLs. This variable is used also by Louzis et al. (2012), Erdinç and Abazi (2014) and Dimitrios et al. (2016) and the expectations are validated by all studies on this topic. Loans to deposit ratio is associated with a liquidity measure for a bank and it indicates the capacity of a credit institution to utilize the collected deposits into loans and at the same time the ability to access external funding.

Shareholders (SH), dependency ratio (DR) and transparency ratio (TR) are qualitative variables and they are introducing managerial decisions. SH is defined as a dummy indicator taking value 1 if the capital is foreign and 0 if the bank has more than 50% national capital. DR is calculated as percentage of the main shareholders and it might influence the management decisions if the value is greater than 50%. The tight control hypothesis introduced by Louzis et al. (2012) illustrates that higher ownership concentration tends to promote prudent risk taking through tighter control of the bank's management. Therefore, ownership concentration is negatively related with NPLs. TR is also a dummy variable and reflects if a bank is listed or not. If the bank is listed, the indicator is equal to 1, otherwise its value is 0. A short presentation of most variables can be seen in Table 1. Two other variables have been also introduced, representing the contribution of the authors regarding the present model: Board Risk Management Ratio (BRMR) and Expert Aggregate Priority Vector (EAPV). The first ratio is defined as number of risk managers divided by total number of Board Members and is considered relevant due to its decision-making process capacity. While the Board of every bank implements a sustainable way of taking decisions, concerning the risk of portfolios, the aim of authors for the topic of NPLs was to find out if there is a correlation between the proportion of such specialists and the evolution of NPLs. The EAPV indicator is a qualitative variable representing the risk managers' opinion about the impact of assets into credit risk. They qualified the non-performing loans as the most important determinant of credit risk from

all banking assets with a score of 22.57%. This result is deducted from the study of Pop and Răduțu (2016), where the banking risk managers from Romanian banking system indicated their perceived importance regarding the most influential ways of decreasing the risk.

The macroeconomic indicators are: unemployment rate (UNEMPL) calculated as Percentage of total labor force and budget deficit (BD) is the percentage of gross domestic product considered deficit during a specific year and country. We used these variables because their evolution represents a change in macroeconomic conditions of Romanian population. An increase of such indicators is considered as a fiscal problem for Romania, which determines an important rise of portfolio loans risks. At the same time, the payment capacity of the Romanians is affected by this evolution of previously mentioned macroeconomic variables. More Romanians are encountering difficulties to pay their debts, if they lose the jobs. This hypothesis is validated by Makri et al. (2014) findings. The macroeconomic data has been taken from World Bank Database.

Methodology

This research determines the positive and negative factors that influence the level of NPLs ratio. Because we are using data from 5 banks of Romanian banking system and the NPLs series present a considerable amount of persistence, the dynamic panel data model is the most suitable option for generating consistent results. This approach is confirmed by Erdinç and Abazi (2014). Following the recent researches in the panel data models conducted by Louzis et al. (2012), Makri et al. (2014), Dimitrios et al. (2016), we are using a dynamic model including multiple types of variables (bank related, macroeconomic and qualitative variables). The same authors confirmed that, in order to provide consistent and unbiased results, the Generalized Method of the Moments difference estimation (GMM difference) is appropriate to be used, being based on first differences and introduced by Arellano and Bond (1991).

Erdinç and Abazi (2014) used several different panel models to explain the evolution of NPLs in 20 emerging European countries during 2000-2011. They used static and random effects model to see if the fixed effects are significantly correlated with the explanatory variables. In the results of a series of correlation tests, they found that NPLs exhibited a significant degree of serial correlation and persistence and a dynamic specification in a panel context is mandatory. After this remark, they followed a similar approach with GMM model to continue their research and obtained consistent results. They applied both system and difference - GMM estimation (two-step, robust) and the methodology used in this paper is similar with their work.

However, we investigate the effect of banking, macroeconomic and managerial qualitative indicators factors on NPLs for two separate periods, t and $t-1$. Our first econometric model is expressed as follows:

$$NPL_{i,t} = a_0 + a_i X_{i,t} + b_i M_{i,t} + c_i Q_{i,t} + \varepsilon_{i,t} \quad (1)$$

where NPL represents the non-performing loans to total gross loans, X denotes the bank specific variables, M is the macroeconomic factors and Q indicates the qualitative managerial indicators, as presented on Table 2. Note that “ i ” corresponds to the examined bank of the sample and “ t ” to the year. Furthermore, with the purpose of extending our investigation, we use one lag for all bank specific, macroeconomic and qualitative managerial regressors, targeting to capture the dynamics of explanatory variables over the

previous year. Generally, the inclusion of time lags is commonly used in the literature e.g. Dimitrios et al. (2016) and Makri et al. (2014). Therefore, our second econometric model is expressed using the following equation:

$$NPL_{i,t} = a_0 + a_i X_{i,t-1} + b_i M_{i,t-1} + c_i Q_{i,t} + \varepsilon_{i,t-1} \quad (2)$$

Table 2. Variable Description

Variable Name	Variable Type	Description
Non-Performing Loans Ratio: NPL	Bank-specific	Loans past due > 90 days divided by Total Gross Loans
Total Assets: TA		Bank's total assets
Loans to deposit ratio: LTD		Total loans divided by total deposits
Return of Equities: ROE	Country specific	Net profit divided by equity
Unemployment: UNEMPL		Percentage of total labor force
Budget Deficit: BD		Percentage of gross domestic product
Transparency ratio: TR	Qualitative	1 if the bank is listed and 0 otherwise
Shareholders: SH		1 for foreign owned banks, 0 otherwise
Board Risk Management Ratio: BRMR		Percentage of Risk Managers within the Board
Dependency ratio: DR		Percentage of the largest shareholder

Source: Authors' own research.

In order to obtain deeper insight into the relevance of explanatory variables, we estimate Equation (1) and (2) in four different versions; we begin by examining only bank specific variables as regressors, secondly only macro variables, then only qualitative managerial indicators and finally all relevant variables. For the GMM estimation, we employed first and second period lagged variables as instruments for the explanatory variables, which are in line with the results of Sargan test.

Results

In the first place, more bank specific and macroeconomic variables have been taken into account and the correlation between all variables has been calculated. After this step, we defined the models respecting the methodology proposed and we eliminated all variables which are strongly correlated (the level of correlation is greater than 40%) with others. After this decision, we computed the eight models we mentioned, this approach being in accordance with Dimitrios et al. (2016). All the results can be found in Table 4. However, the impact of each variable considered in our models is reflected in Table 3.

We used the logarithm of total assets because the amounts are larger than the ratios from the models. This variable indicates the bank's size. TA_t and TA_{t-1} are found relevant in all models containing the variable for a level of confidence greater than 97%. The impact of TA in NPLs is positive and respects the "too big to fail" hypothesis proposed by Louzis et al. (2012). They associated large banks with excessive risks by increasing their leverage under this hypothesis presumption and therefore they have more NPLs. Louzis et al. (2012) found for a bank size up to 30% of the total banking system that the leverage is positively related with NPLs and mortgages. Their findings validate our results because our input data comes from the top five banks, by assets, in the Romanian banking system. The market share of Romanian Commercial Bank, the biggest in our system, is equal to 16.28% in 2016.

Table 3. *Determinants of NPLs*

Variable	Sign
Total Assets	(+)
Return on Equity	(-)
Loans to Deposit Ratio	(+) / Not significant
Unemployment	(+)
Budget Deficit	(+) / (-)
Expert Aggregate Priority Vector	(+) / (-)
Shareholders	Not significant
Dependency ratio	(+) / Not significant
Transparency Ratio	(+) / Not significant
Board Risk Management Ratio	(-) / Not significant

Source: Authors' own research.

Another bank-specific indicator is ROE, used as a profitability measurement. ROE_t and ROE_{t-1} are significant for all the models we computed. The negative impact of ROE found on NPLs is in accordance with the existing literature: Dimitrios et al. (2016) and Makri et al. (2014). The results for ROE are supporting the bad management hypothesis of Berger and De Young (1997). A profitable bank is less likely to have unsafe activities such as granting risky loans. The highest impact of ROE on NPLs is found in the first model, when an increase with 1% of ROE will determine a decrease of 0.632851% of NPLs. Using all the variables (bank specific, macroeconomic and qualitative managerial variables), the impact of ROE is equal to -0.190191 and is significant at a 91% level of confidence. In the rest of the model where we used ROE, we found it relevant at 99% level of confidence. Loans to Deposit ratio has been also added into a GMM model by Erdinç and Abazi (2014), Dimitrios et al. (2016) and Makri et al. (2014) and it can be explained as a measure of bank's relative access to external funding. Makri et al. (2014) explained the LTD as a measure of bank liquidity by measuring the funds that a bank has used into loans from the collected deposits. Our results have been reflected by other papers, and the insignificance of LTD has been also found in Makri et al. (2014). Otherwise, Dimitrios et al. (2016) presented LTD having a positive and significant effect on the NPLs and we found the same sign in the lagged variables model under a 90% level of confidence.

Table 4 Models' results

Model No.	Model Definition	RResults	Explanation variables										Sargan Test
			TA	ROE	LTD	EAPV	UNMPL	BD	SH	DR	TR	BRMR	
Model 1 - Only Macroeconomic indicators	$NPL_t = UNMPL_t + BD_t + Et$	Coef.	X	x	X	x	1.679430	0.427682	X	x	X	x	19.2591
		Prob.	X	x	X	x	0.0000	0.0515	X	x	X	x	0.023078
Model 2 - Only Bank specific variables	$NPL_t = LOG(TAt) + ROEt + LTD_t + Et$	Coef.	0.022407	-0.632851	-0.024689	x	x	X	X	x	X	x	5.473301
		Prob.	0.0005	0.0059	0.4497	x	x	X	X	x	X	x	0.705996
Model 3 - Only Qualitative variables	$NPL_t = EAPV_t + SH_t + DR_t + TR_t + BRMR_t + Et$	Coef.	X	x	X	0.280435	x	X	0.058343	0.067770	0.043326	-0.537576	16.72579
		Prob.	X	x	X	0.1460	x	X	0.2856	0.2051	0.0577	0.0093	0.010346
Model 4 - All types of variables included	$NPL_t = LOG(TAt) + ROEt + LTD_t + EAPV_t + UNEMPL_t + BD_t + SH_t + DR_t + TR_t + BRMR_t + Et$	Coef.	0.074911	-0.190191	0.002456	-4.285486	7.756544	0.540548	-0.09387	0.109155	-0.022105	-0.241631	0.004964
		Prob.	0.0002	0.0859	0.9363	0.0010	0.0046	0.0452	0.0365	0.0836	0.4184	0.1940	0.943831
Model 5 - Only lagged Macreconomic indicators	$NPL_t = UNMPL_{t-1} + BD_{t-1} + Et-1$	Coef.	X	x	X	x	1.149425	-0.515898	X	x	X	x	16.92323
		Prob.	X	x	X	x	0.0000	0.0816	X	x	X	x	0.049932
Model 6 - Only lagged Bank specific variables	$NPL_t = LOG(Tat-1) + ROEt-1 + LTD_{t-1} + Et-1$	Coef.	0.017866	-0.566136	0.004289	x	x	X	X	x	X	x	7.962506
		Prob.	0.0000	0.0004	0.8295	x	x	X	X	x	X	x	0.437141
Model 7 - Only lagged Qualitative variables	$NPL_t = EAPV_{t-1} + SH_{t-1} + DR_{t-1} + TR_{t-1} + BRMR_{t-1} + Et-1$	Coef.	X	x	X	0.863409	x	X	-0.033938	0.100723	-0.027991	-0.552058	14.40235
		Prob.	X	x	X	0.0000	x	X	0.3859	0.1615	0.3028	0.0112	0.025451
Model 8 - All types of lagged variables included	$NPL_t = LOG(TAt-1) + ROEt-1 + LTD_{t-1} + EAPV_{t-1} + UNEMPL_{t-1} + BD_{t-1} + SH_{t-1} + DR_{t-1} + TR_{t-1} + BRMR_{t-1} + Et-1$	Coef.	0.043887	-0.116051	0.048547	-2.852859	4.698680	-0.560859	-0.010028	0.014983	0.029335	-0.184551	5.810073
		Prob.	0.0370	0.0113	0.1178	0.0112	0.0291	0.0147	0.7081	0.7934	0.1432	0.3948	0.015932

x – not used in the model

Source: Authors' own research.

Macroeconomic variables have both a positive relationship with NPLs and the results are validated by Dimitrios et al. (2016) and Makri et al. (2014). A bigger unemployment rate will affect the customers' ability to pay their loans. $UNEMPL_t$ is used in two models (Model 1 and 4) and $UNEMPL_{t-1}$ is found in other two models (5 and 8). In all cases, this variable is significant and has a positive impact on NPLs under a 99% confidence level. $UNEMPL$ is the powerful determinant of NPLs in our models, having the highest value for the fourth model, where we included all types of variables: macroeconomic, bank specific and qualitative managerial ones. In this case, its value is 7.756544 and the lowest value is in the fifth model having only macroeconomic lagged variables. In Model 5, an increasing with 1% of $UNEMPL$ in the previous year will positively influence the level of actual NPL with 1.15%.

Louzis et al. (2012) used unemployment rate as part of macroeconomic variables to find if this variable has an impact on NPLs. They found it significant in all models and it was the most relevant factor for business NPLs. Makri et al. (2014) found a strong positive relationship between unemployment rate (actual and lagged) and NPLs. The same conclusions were presented by Dimitrios et al. (2016). All these afore-mentioned literature findings are confirming our results regarding the impact of unemployment rate in the evolution of NPLs of the Romanian banking system. In some cases, Romania has been introduced as part of research.

BD, as we defined it, represents the budget deficit calculated as percentage of Gross Domestic Product. The relationship found between BD_t and NPLs is a positive one, an increasing of budget deficit being considered as a fiscal problem for Romania which is determining an important rise of portfolio loans risks. This conclusion is sustainable and it was also found by Makri et al. (2014). Dimitrios et al. (2016), who explained that Euro-area peripheral countries (GIIPS) only showed BD in positive relationship with NPLs. A higher BD_{t-1} determines a negative behavior of current NPL value in both models we introduced it. In the last model computed with all type of lagged variables, an increase of the previous year budget deficit of 1% indicates a decrease of 0.56% in the current NPLs. The Romanian case for the analyzed period and banks is the one that has only deficit, the average being 4.11%. Rinaldi and Sanchis-Arellano (2006) examined the impact of macroeconomic situations in the Eurozone to the NPLs. They concluded that budget deficit and public debt have a positive impact on non-performing loans and this relationship highlights that fiscal problems in these countries might lead to a significant rise of problematic loans. Makri et al. (2014) discovered that budget deficit did not illustrate a significant role on NPLs ratio in several computed models.

Qualitative managerial indicators are used in this model as a contribution to the existing literature and it is confirmed by the moral hazard of 'too-big-to-fail' banks (Louzis et al., 2012). Another important role of managerial decisions is related with financing cost, because for listed banks it tends to be greater. This cost determines the profitability of the bank and the shareholders are putting pressure on managers to have higher performance because their revenues depend on the bank's performance. We incorporated several qualitative variables in four models, but not all of them are influenced the NPLs. In most of the cases the results indicated a positive relationship between managerial variables and NPLs for both periods, t and $t-1$. $EAPV_t$

and $EAPV_{t-1}$ are significant in all models, but with different behaviors from one model to another. Considering only qualitative variables, $EAPV_t$ and $EAPV_{t-1}$ have a positive impact on NPLs ratio. If the banks' risk managers consider non-performing assets more important for capital adequacy of their banks, the level of NPLs will rise with less than 1%. The reason is related to the pressure they have on their heads, as the banks are foreign owned, in contrast with the local capital ones. Erdinç and Abazi (2014) pointed that most of foreign owned banks in emerging countries are having high profit expectations from their affiliated banks in the region and this determines an aggressive lending strategy. This result has the role of validating our conclusions regarding EAPV for both time streams (t and $t-1$). The negative impact of EAPV to NPLs found in the models when we used all types of variables is explained by the fact that an increasing of non-performing loans perception for the risk managers will determine a change in the banks' strategies and the managers will perform some actions for reducing the credit risk. Hence, by having a full view of the situations by considering the banking indicators and the macroeconomic and qualitative variables, they can manage better the situation and efficiently change the portfolio.

In the same way, an increase of dependency ratio will determine the risk managers to consider NPLs more relevant for capital adequacy. But, when we are considering all types of variables, the behavior of EAPV is changing in both modeled periods. The impact on NPLs is negative and significant. Considering all the details in place, bank specific, macroeconomic and others, an increasing of NPLs importance for banks' risk managers will rise the attention paid to the level of non-performing ratio. From this point onwards, the decisions on short and long terms taken by managers will influence more the level of NPLs. The negative impact is easy to understand and logical, the impact of a current EAPV with 1% leading to a NPLs decrease by 4.285%. A smaller coefficient has been found for $EAPV_{t-1}$ equal to -2.852859. The number of risk managers in the total number of board members is found significant only in the Models 3 and 7 (only qualitative variables). Its negative impact is determined by the impact of having greater decision-making power of risk specialists. It still influences negatively the NPLs also, when all the variables are considered, but it loses the relevance.

Other variables used as a proxy of managerial decisions are the origin of the capital (SH), dependency ratio and transparency. Every indicator reflects a part of bank's management. The importance of the origin of capital is confirmed by Erdinç and Abazi (2014) and they introduced a variable to count the number of foreign owned banks in a banking system. They presented foreign banks as more engaged banks in risky lending strategies, because their parent banks want better performance in emerging countries. We used a dummy variable to test if NPLs are determined by ownership type. In our models computed for Romanian banking system, we didn't find significant this variable. Except for Transylvania Bank, the rest have SH equal to 1 for the whole period, therefore, it can be stated that Romanian banking system is a foreign owned oriented one. Another management related variable is the dependency ratio, which can explain how powerful the biggest shareholder of the bank is. The power is measured as capacity of decision-making alone. DR is used in Models 3,4 and 7,8, but in only none of them DR was meaningful. It can be considered a determinant of NPLs in Romanian banking system only if the managers are considering the types of

variables with a confidence level of 91%. Its impact on NPLs is equal to 0.109155% for a 1% increasing of ownership concentration. The positive sign of DR is rejecting the 'Tight control' hypothesis of Eastern European banks (Louzis et. al., 2012), but it is in accordance with the previous paper mentioned results found in Greek banking system. The explanation for this is represented by the characteristics of Romanian banking system. It is a predominantly foreign owned system, having as "parents", large international banking groups. On the other hand, the banks were known as risky credit institutions, especially right before the last financial crises, when they offered large amounts of credit without the need to have something to support it. The scope was to increase their market share and the number of clients. Transparency ratio indicates if the bank is listed to a stock exchange or not. Most of the banks from Romanian top five are listed to Bucharest Stock Exchange, the only exception during the analyzed period being UniCredit Bank. This is an important management tool because the number of shareholders is higher and all financial reports are mandatory. More investors are interested in banking results and on the other hand, the existing ones are more focused on profitability of the bank. The financing cost is higher for listed banks, even if they have more sources, including here also the stock market. This remark is in accordance with "bad management" hypothesis of Louzis (2012) because in many cases the listed banks are less cost efficient than the others, due to their resources' access. More explanations of "bad management" hypothesis are presented by Berger and De Young (1997), where they found that low measured cost efficiency is a signal of poor senior management practices, which applies to both daily operations and to the loan portfolio management. Managers of these banks also do not practice adequate loan underwriting, monitoring, and control and this is happening because they have poor skills in credit scoring. They are not also fully competent in measuring the value of collateral and they encounter issues in controlling and monitoring the borrowers after a loan is offered to a customer. We used TR in models containing only qualitative variables (Models 3 and 7) and in the ones with all types of indicators (Model 4 and 8). With a confidence level of 94%, TR is significant only in Model 3, having a positive impact on NPLs. Having a higher financing cost and a more careful surveillance from their shareholders, these banks tend to have a riskier approach and a less restrictive lending activity. They are profitability oriented and for this reason, the positive relationship between TR and NPLs is explained.

We validated the results using several econometric tests provided by the existing literature and computed using the software for GMM regressions. The GMM approach helped us to find out unbiased and consistent results because it eliminated the serial correlation and persistence of the panel data used. Instead of following an OLS method, our choice was the methodology initially proposed by Arellano and Bond (1991) and developed by Erdinç and Abazi (2014). The adjusted R squared indicator is powerful only in the models with all types of variables, so for the Model 4 and 8 in our case and its values is greater than 0.6 in both cases. The same applicability has Durbin-Watson for GMM methodology and in Model 3 the value is 1.957844 and for Model 8 we found it equal to 1.847588. These two models are reflecting the best set of NPLs determinants because they include at the same time banking, macroeconomic and qualitative variables, not only one type of them. The existing literature presents Sargan test as being one of the strongest robustness tests used for GMM models.

Following this approach, F-Statistics is no longer used, but another statistic is calculated as a result of Sargan test. J-statistics and its probability are presented in Table 4. Louzis et al. (2012) made an interpretation of this test as it follows: the null hypothesis is defined as all restrictions are correctly done in the model and the alternative hypothesis represents the opposite value of the first one. In the case of null hypothesis, the distributions are asymptotically distributed as chi-squared. This conclusion is validated by Arellano and Bond (1991). Rejection of null hypothesis implies inconsistency in GMM estimates. We accepted the null hypothesis under 99% level of confidence if the probability of J – statistic is greater than 0.01. All our models accepted the null hypothesis and in this case, we can validate our results. The same approach of testing the results can be found at Makri et al. (2014) and Dimitrios et al. (2016). The biggest value of the probability of J– statistic is found at the model with all variables included and it is equal to 0.943831 with the statistic value of 0.004964.

Conclusions

Our research is focused on explaining the most important determinants of NPLs ratio from Romanian banking System by using top five banks (by assets). Their cumulated market share is more than 59% of total assets during the period 2007–2016. We used a Generalized Method of the Moments to determine the strong positive or negative correlation of the bank-specific, macroeconomic and qualitative managerial indicators to the NPLs.

Our expectations were to find out how bank size, profitability measured by ROE, liquidity expressed by loans to deposit ratio, macroeconomic variables such as unemployment rate and budget deficit, and managerial related indicators for two different periods, the current and the previous one, influence the level of “bad” loans to total gross loans. We expected a positive relationship between total assets, loans to deposits ratio, unemployment rate, EAPV and NPLs and a negative impact of ROE, BRMR to NPLs. At the same time, the budget deficit has rather an unpredictable behavior.

Our results are consistent with expectations and with the existing literature as well. For banks’ specific variables, we found the following relationships with NPLs: TA in both periods is positive correlated with NPLs and respects the “too-big-to-fail” hypothesis proposed by Louzis et al. (2012). ROE is supporting the bad management hypothesis of Berger and De Young (1997) and impacts the NPLs in an indirect way. Our results of LTD impact on NPLs have been reflected by other papers, LTD not showing a relevant impact on NPLs like in research conducted by Makri et al. (2014). Macroeconomic variables (unemployment rate and budget deficit) have both a positive relationship with NPLs and the results are validated by Dimitrios et al. (2016) and Makri et al. (2014). $EAPV_t$ and $EAPV_{t-1}$ have a positive impact on NPLs ratio and at the same time we found a positive sign of DR in accordance with Loiuz et. al. (2012), results found in Greek banking system.

Our findings are reliable for both banking surveillance authorities and banks’ management because the evolutions of the most important determinants of non-performing loans are explained in this paper. The managers should be aware that deteriorated macroeconomic conditions (unemployment, budget deficits) will increase NPLs because the percentage of population with problems in paying their

debts is increasing. The authorities should pay more attention to less performing banks and to the ones from the top, by assets, because the behavior of both can be determined by risky managerial decisions. Our contribution is underlined by the introduction of qualitative managerial variables into our models. More specific, previous research of the authors analyzed the decisions of optimal capital allocation which should be done by banks for reducing the associated risks. The output consisted in the aggregated perceived risk associated with the most sensible balance sheet item evaluated by the risk management experts (EAPV).

Further research will consider EAPV, as a bank specific impact, and can be determined using an AHP approach, where the experts input will provide a sustainable way of adopting decisions and reducing risks.

References

- Arellano, M., Bond, S. (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*, Vol. 58, No. 2, pp. 277-297.
- Barseghyan, L. (2010), "Non-Performing Loans, Prospective Bailouts, and Japan's Slowdown", *Journal of Monetary Economics*, Vol. 57, No. 7, pp. 873-890.
- Berger, A., De Young, R., (1997), "Problem loans and cost efficiency in commercial banks", *Journal of Banking and Finance*, Vol. 21, pp. 849-870.
- Cepoi, C.O., Toma, F.M. (2016), "Estimating Probability of Informed Trading on the Bucharest Stock Exchange", *Finance A Uver-Czech Journal of Economics and Finance*, Vol. 66, No. 2, pp. 140-160.
- Chortareas, G., Logothesis, V., Magkronis, G, Zekente, K-M. (2016), "The effects of banking supervision on central bank preferences: Evidence from a panel data", *Economics Letters*, Vol. 140, pp. 11-13.
- Damian, V.C, Cepoi, C.O. (2016), "Volatility Estimators with High-Frequency Data from Bucharest Stock Exchange", *Economic Computation and Economic Cybernetics Studies and Research*, Vol. 50, No. 3, 2016, pp. 247-264.
- Dimitrios, A., Helen, L., Mike, T. (2016), "Determinants of non-performing loans: Evidence from Euro-area countries", *Finance Research Letters*, Vol., 18, pp. 116-119.
- Erdinç, D., Abazi, E. (2014), "The Determinants of NPLs in Emerging Europe, 2000-2011", *Journal of Economics and Political Economy*, Vol. 1, pp. 112-125.
- Louzis, D.P., Vouldis, A.T., Metaxas, V.L. (2012), "Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios", *Journal of Banking and Finance*, Vol. 36, pp. 1012-1027.
- Makri, V., Tsagkanos, A., Bellas, A. (2014), "Determinants of Non-performing loans: The case of eurozone", *Panoeconomicus*, Vol. 61, pp. 193-206.
- Pop, I.D., Răduțu, A. (2016), "The allocation of resources in the Romanian Banking Sector: an AHP approach", *3rd International Multidisciplinary Scientific Conference on Social Sciences and Arts, Political Sciences, Law, Finance, Economics and Tourism Conference Proceedings*, Vol. III, SGEM 2016, Bulgaria, pp. 585-592.

- Răduțu A., Pop I.D. (2016), "Decision models in Romanian Banking Sector after the last world financial crisis: an AHP Approach", The 12th International Scientific Conference eLearning and Software for Education, Elearning Vision 2020!, Vol. I, ELSE, Romania, pp. 463-470.
- Rinaldi, L., Sanchis-Arellano, A. (2006), "Household Debt Sustainability, what Explains Household Non-Performing Loans? An Empirical Analysis." European Central Bank Working Paper Series 570.
- Sharifi, F., Otadi, M. (2015), "Identifying and ranking the factors non-performing loans in Parsian Bank's", Journal of Data Envelopment Analysis and Decision Science, Vol. 2, pp. 118-123.
- Zeng, Shihong. (2011), "Bank Non-Performing Loans (NPLS): A Dynamic Model and Analysis in China", Modern Economy, Vol. 3, No. 1, pp. 100-110.