LESSONS FROM THE IMPACT OF INTERNAL AND MACROECONOMIC DETERMINANTS OF BAD LOANS IN CEE BANKS

Bogdan Florin FILIP*

Abstract

The paper aims identifying and analysing the determinants of bad loans in the banks from Central and Eastern Europe, while their accumulation may lead to malfunctions on macroeconomic level. Analysing 38 of the most representative banks in the region during 2004-2013, we found significant positive linkages of bad loans ratio with cost to income ratio, unemployment and crisis, but also significant negative linkages with bank size, activity mix, bank risk taking behaviour, real GDP growth and inflation. Moreover, using Panel Least Squares Fixed Effects Method, we found that the main determinants of bad loans ratio increase are bank size, crisis, unemployment and cost to income ratio. Contrary, activity mix, bank risk taking behaviour, real GDP growth and inflation proved to act against bad loans accumulation. The results offer important lessons which may be useful in the future both for the banks and also for the governments from this region.

Keywords: bad loans, internal determinants, macroeconomic determinants, crisis

1. Introduction

The issue of bad loans is one of great importance especially for the banks, while they are directly confronted with the risks and the efficiency problems that come from their impossibility of recovering the loans formerly granted. On one hand, bad loans are seriously affecting the profits of the banks because they generate high costs with provisions, and, on the other hand, if their level increases rapidly, they might also lead to the incapacity of a bank to fulfil its obligations towards its clients, especially towards its deponents, which may end in bank's bankruptcy. Moreover, the crush of one bank may result in a decrease of trust of a large number of customers in the banking system, especially if most of banks are confronted with increasing levels of bad loans, as it happens during crisis times, which may cause problems for the other banks functioning or even more bank crushes.

*Bogdan Florin FILIP is professor at Alexandru Ioan Cuza University of Iaşi, Romania; e-mail: bogdan.filip@feaa.uaic.ro.

ISBN 978-606-714-428-4 | ISSN 2393-2384 | ISSN-L 2392-8867

While the proper functioning of the banking system is undoubtedly an important engine for assuring the development of the economy of a country, because banks provide significant financing for activities which generate added value and hence GDP growth, the accumulation of bad loans can become a fundamental problem for the economy. This issue becomes also acute in the case of those countries which depend almost entirely on their banking system, because their capital markets are less developed, as is the case of Central and Eastern European Countries.

On the other hand, the banking system functionality, including the recovery of the banking loans may also depend on the macroeconomic environment, since a better functioning of the economy creates conditions for enhancing the activity, as well as the performance of banking system, the two of them stimulating each other.

However, it is equally true that the intertwining between the functioning of the economy and the banking activity performance may also manifest itself in a way in which the negative performance of each of the two is transmitted from one to the other. This may eventually lead, in the worst case scenarios, to the manifestation of the twin crises phenomenon (Kaminsky and Reinhart, 1999), when the banking crisis and the economic and financial crisis are mutually empowering themselves and contribute to the deepening of each other.

Statistically, it can be noticed that the emergence of banking crises is strongly connected with the rapid accumulation of large volume of bad loans. This connection has been proven also in the case of the recent financial and economic crisis while the occurrence and the manifestation of this crisis, in terms of amplitude and expansion effects, were closely linked to the functionality problems of the banking systems and mainly to the deterioration of the quality of bank loans.

Due to the previous reasons, the evaluation of the factors that impact on the size of bad loans and of the amplitude of their effects has become an important research issue. In this context, our paper aims to select the most representative determinants of bad loans and to analyse their impact in the case of 38 banks from Central and Eastern Europe, while the economies from this area are strongly dependent by the functionality of their banks.

2. Literature review

The issue of bad loans became a research theme mainly after the beginning of this century and especially after the recent financial and economic crisis whose negative effects were very serious and whose roots were in the distorted functionality of the banks, reflected in the rapid accumulation of bad loans. Thus, there can be found in literature several studies, some of them theoretical and many others empirical ones, that are searching to identify the possible causes leading to the increase of bad loans and also the measures to be taken in order to discourage this phenomenon. In this regard, there can be mentioned a number of empirical studies which are focused either on the analysis of the determinants of bad bank

loans in the banking system of a specific country (Salas and Saurina, 2002; Khemraj and Pasha, 2009; Louzis, Vouldis and Metaxas, 2012; Filip, 2014), or on broader analyses on the banks from specific regions or groups of countries (Fofack, 2005; Espinoza and Prasad, 2010; Nkusu, 2011; Castro, 2013; Klein, 2013; Chaibi and Ftiti, 2015).

Some of the empirical papers upon the occurrence of bad loans phenomenon are based on studying the evolution of the dimension of bad loans, in terms of their volume, but most of the studies consider that a much proper proxy should be considered the ratio of bad loans, determined as the proportion of bad loans in total gross loans granted by a bank. In this regard, we also consider that this ratio is more appropriate for an analysis, because such a ratio gives a better image on the amplitude of the bad loans phenomenon at the level of a specific bank.

The existing literature also brings into attention several approaches on the determinants of the bad loans, but synthetizing the content of the previous studies it emerges the idea that there can be distinguished practically two main categories of determinants. The first category refers to the determinants linked directly to the bank itself, which are normally under the control of the bank and depend on bank's policy. Such determinants, considered as internal or bank-level ones, can be bank size (Khemraj and Pasha, 2009; Chaibi and Ftiti, 2015), cost efficiency (Espinoza and Prasad, 2010, Klein, 2013), capital adequacy (Fofack, 2005; Nkusu, 2011; Klein, 2013), excessive lending (Salas and Saurina, 2002) or, in other words, bank risk taking behaviour (Nkusu, 2011) etc.

Complementary, a second category of bad loans determinants refers to those factors of external nature, which are not controllable by the banks, expressing usually the macroeconomic conditions and reflected by economic indicators (Fofack, 2005; Nkusu, 2011; Klein, 2013) such as GDP growth or GDP per capita growth, inflation rate and unemployment rate, which have positive or negative impact on the repayment capacity of the borrowers.

Most of the empirical studies are considering that bank size can be one of the factors that may impact on the bad loans ratio. However, although most studies have agreed on the importance of this factor, there isn't a consensus on the way it influences the bad loans accumulation. Some of the studies have revealed a negative influence of bank size on the bad loans ratio (Hu, Yang and Yung, 2004; Espinoza and Prasad, 2010), but there are also other studies that showed a positive determination relationship between bank size and this ratio (Khemraj and Pasha, 2009; Chaibi and Ftiti, 2015; Filip, 2015). Moreover, few other empirical studies have shown no significant effects of bank size on the ratio of bad loans (Ennis and Malek, 2005; Klein, 2013). Even if contradictory, these results can each of them have a reasonable ground while, in my opinion, the size of a bank can play a positive role in limiting the proportion of bad loans if it facilitates a better regulation and supervision of bank lending activity, or, on the contrary, if these conditions are not fulfilled, the high volume of loans can become difficult to be administrated, leading thus to many defaults. However, while the banks in Central

and Eastern Europe, even of big size, had little time to adjust their regulation and supervision policy, being more concerned of gaining rapidly higher market shares, our first hypothesis is:

H1: *the bank's size is positively associated with increases in bad loans.*

Capital adequacy, as also many researchers consider, should ensure the premises for a solid activity of a bank, including the lending one, and should act for diminishing the volume of bad loans and also their proportion (Berger and DeYoung, 1997; Klein, 2013) protecting the stability of the bank against the potential negative effects of such loans. Even so, in our opinion, the intensity of its impact will strongly depend on each bank's policy and on the action of the other factors and there are in literature several empirical studies that did not confirm its impact of limiting the bad loans proportion, but even on contrary (Fofack, 2005; Khemraj and Pasha, 2009). However, based on the previous considerations, we will develop our analysis starting from a second hypothesis, known as "the moral hazard hypothesis":

H2: *low-capitalization of banks lead to increases in bad loans.*

There are also several studies that showed the importance of the cost efficiency or cost inefficiency, the latter proxied by cost to income ratio, as a determinant with significant impact on the bad loans ratio. However, while some studies (Berger and DeYoung, 1997; Podpiera and Weill, 2008; Espinoza and Prasad, 2010) revealed a positive determination, consisting in an increase of bad loans proportion on the background of increased costs, other studies showed a reversed determination relationship (Chaibi and Ftiti, 2015) or no significant impact (Klein, 2013). In this context, we appreciate that the existence of some high expenses of the bank might confirm its concern and financial effort for rigorous tracking and recovery of the granted loans, which normally leads to the limitation of the proportion of bad loans. On the other hand, from another perspective, if there exist a poor management of the resources, this will cause excessive expenses whose coverage might be made by the bank by granting more loans, on higher interest rates, but usually more risky ones. Starting from these observations, we will consider a third hypothesis in our analysis:

H3: *cost inefficiency is positively related with increases in bad loans*.

At the same time, we consider that the accumulation of bad loans can be prevented or limited if the bank, following its objective to generate significant revenues, is less forced to assume too high risks by granting loans. Thus, if the bank is capable to get revenues from other operations less risky than lending, by developing a mix of other activities, the danger of risking too much in lending area can be avoided (Hu, Yang and Yung, 2004). Consequently, it can be admitted a fourth hypothesis:

H4: *the activity mix should have an effect of limiting the bad loans proportion.*

Looking further at the risks assumed by banks, we note that some authors (Salas and Saurina, 2002; Klein, 2013) highlighted that excessive lending creates

the most premise for the occurrence and accumulation of bad loans and becomes so a major determinant of them. This idea is based on the reason that a rapid increase in loan volume results normally on the background of easing the regulations regarding the eligibility of loan applicants, which increases the risk that many loans will not be reimbursed. On the other hand, a similar connection with bad loans was made in literature in terms of bank risk taking behaviour and some papers showed a negative effect of this factor on the bad loans ratio (Khemraj and Pasha, 2009; Nkusu, 2011; Filip, 2015), while the increase of the volume of bad loans was taken over by the advance of the total gross loans. In this regard, we believe that bank risk taking behaviour of a bank may lead to limiting the proportion of bad loans only if the loans are used efficiently, leading to creating added value and GDP growth. Otherwise, rationally, excessive lending not compensated by a substantial increase in GDP will determine an increase in bad loans negative effect. As consequence of these considerations we will test a fifth hypothesis:

H5: *bank risk taking behaviour is positively associated with bad loans accumulation.*

One of the most representative external determinants with impact on bad loans ratio considered in most of the empirical papers (Salas and Saurina, 2002; Khemraj and Pasha, 2009; Bofondi and Ropele, 2011; Louzis, Vouldis and Metaxas, 2012; Erdinc and Abazi, 2014; Filip, 2014) is economic growth, proxied usually by GDP growth or GDP per capita growth. Almost all of the studies have found a negative influence of economic growth on the bad loans ratio, the economic growth contributing to reducing this ratio. This causality relationship, which we consider to be reasonable, is based on the fact that economic growth is reflected in principle in an increase of the income, including that of the borrowers, which determines an improvement in their capacity to return their loans, that normally leads to lower risks for the banks to accumulate other bad loans and also creates premises for reducing the volume of the existing ones. On the other hand, a downward trend of GDP has naturally adverse effects that would lead normally to increasing the volume of bad loans. Therefore, we consider the following hypothesis:

H6: *economic growth in negatively related with increases in bad loans.*

Another macroeconomic determinant of bad loans considered by the literature is inflation, which appears, however, to have ambiguous effects on bad loans ratio (Kjosevski and Petkovski, 2017). Some studies showed a positive determination relationship between inflation and bad loans ratio, while other papers revealed a contrary one. An increase in inflation rate erodes the debtors' ability to pay and this leads to more bad loans and an increase of bad loans ratio, which shows a positive determination relationship between inflation and bad loans ratio (Khemraj and Pasha, 2009; Fofack, 2005; Škarica, 2014). On the other hand, also, an increase in inflation rate makes more easy the repayment of due amounts by the borrowers (Nkusu, 2011; Klein, 2013, Erdinc and Abazi, 2014), because while the nominal resources of the debtors are increasing the creditor banks are not updating

their claims with the inflation rate and so, it results a reduction in the real value of the loans to be paid back and making easier the repayments and limiting the risk of new bad loans. As consequence we will consider for our analysis a seventh hypothesis:

H7: *inflation is negatively associated with increases in bad loans.*

An important impact on the bad loans ratio can also come from unemployment. Changes in unemployment rate determine similar variations of bad loans ratio, the determination relationship being proved in many empirical studies (Bofondi and Ropele, 2011; Nkusu 2011; Klein, 2013; Chaibi and Ftiti, 2015, Anastasiou, Louri and Tsionas, 2016) to be a positive one. Unemployment makes some of the borrowers to lose their capacity of reimbursement leading to the transformation of their current loans into bad loans. Moreover, by generating the reduction of the total income unemployment leads to lower demand of goods and services, determining the reduction of production and sales of the companies and diminishing also the repayment capacity of those companies (Louzis, Vouldis and Metaxas, 2012) leading to other bad loans, this time of these companies. Based on these considerations we admit another hypothesis:

H8: *unemployment leads to increased bad loans ratio.*

Beside these specific macroeconomic determinants we also consider that bad loans ratio depends on the general macroeconomic developments, especially on the manifestation of major negative phenomena such as financial and economic crisis (Erdinc and Abazi, 2014; Beaton, Myrvoda, and Shernnel, 2016), which affect the economic activity and, particularly, the banking activity. We admit, under these circumstances, the next hypothesis:

H9: crisis manifestation causes increasing of bad loans.

Based on the above observations, our study will aim to test if the above hypotheses are confirmed in the case of the banks from Central and Eastern European countries.

3. Data and Methodology

Our research is focused on analysing the impact of the internal and macroeconomic factors on the evolution of the bad loans on a sample of 38 of the most representative banks from Central and Eastern Europe, as follows: 12 banks from Poland, 7 from Hungary, 5 banks from Romania, 4 banks from Czech Republic, 3 banks from Slovakia, 3 banks from Croatia, 2 banks from Bulgaria, 1 bank from Estonia and another 1 from Latvia, respectively. Banks' data were obtained from Orbis Bank Focus Bureau van Dijk database while the macroeconomic data were obtained from Global Financial Development Databank (GFDD) of World Bank and the World Bank Databank and all of them are covering a period of 10 years, starting from 2004 until 2013.

We estimate the dimension of the bad loans of the considered banks through the bad (non-performing) loans ratio, which will be used as dependent variable in our econometric analysis.

Based on the literature and the observations we mentioned before, we will use further in our analysis two main categories of determinants of bad loans. First of all, the internal determinants consist in bank size, capital adequacy, cost inefficiency, activity mix and bank risk taking behaviour. Secondly, we consider as macroeconomic (external) determinants the indicators real GDP growth rate, the inflation rate, and the unemployment rate. Beside them, we take into account also the impact of the global economic environment, which in the period under analysis was marked by the financial crisis manifestation and in this regard we introduce the dummy variable 'crisis'. Thus, the independent variables, their sources and their expected effects may be synthetized as shown in Table 1.

Table 1. Determinants of bad loans ratio – independent variables

Independent variable/ Determinant	Indicator	Symbol	Expected relationship (+/-)	Source
Internal determinants				
Bank size	Logarithm of Total Assets	Log(TA)	+/-	ORBIS Database
Capital adequacy	Capital to Assets Ratio (%)	CAS	-	ORBIS Database
Cost inefficiency	Cost to Income Ratio (%)	C_I	+/-	ORBIS Database
Activity mix	Non Interest Revenues to Average Assets (%)	NIR_AvA	-	ORBIS Database
Bank risk taking behaviour	Net Loans to Total Assets (%)	NetL_TA	+/-	ORBIS Database
Macroeconomic determinants				
Economic growth	Real GDP growth rate (%)	RGDPG	-	GFDD World Bank Database
Inflation	Inflation rate - CPI (%)	INFLR	+/-	GFDD World Bank Database
Unemployment	Unemployment rate (%)	UNEM	+	GFDD World Bank Database
Crisis manifestation	Crisis	Crisis	+	dummy

Starting from these basis the development of our analysis aims processing and interpretation of the panel data of the considered banks from Central and Eastern Europe, by using Pearson correlations, respectively by building an econometric model and testing it using the Panel Least Squares Fixed Effects method. This will allow us to draw the necessary conclusions and to show in which way the lessons learned from the experience of these banks may serve for preventing or at least limiting the accumulation of bad loans and the consequent negative effects of them.

We consider that a deeper analysis of the determinants of bad loans in the considered banks from Central and Eastern Europe can be performed by using the Panel Least Squares method for building and testing an econometric regression model in order to emphasize the relationships between the dependent variable (bad

loans ratio) and the other variables, considered to be independent ones. Therefore, we build and use a fixed effects econometric model whose regression equation is the following one (1):

$$y_{j,t} = c + \beta_{i,j,t} \bullet X_{i,j,t} + \beta_{e,j,t} \bullet X_{e,j,t} + \beta_{c,j,t} \bullet crisis + \mu_j + \upsilon_t + \varepsilon_{i,t} \quad (1)$$

where, j stands for the specific bank, t stands for the year, y represents bad loans ratio, X_i are internal determinants, X_e are macroeconomic (external) determinants, 'crisis' is the dummy variable for crisis manifestation, β_i are the coefficients of the internal determinants, β_e are the coefficients of the external determinants, β_c is crisis coefficient and μ_j are the unobserved bank specific effects, υ_t is the unobservable time effect and $\varepsilon_{j,t}$ is the white-noise error term.

4. Results and remarks

Processing of the statistical data included in our assessment as the first step of the analysis led to the following general characterization results, for the period 2004-2013, shown in Table 2:

Table 2. Descriptive statistics of the considered variables, 2004-2013

Variable	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
NPLR	8.68002	6.29180	7.20792	1.73822	6.117058	288.8737	0.000000
LOG(TA)	16.21397	16.11793	0.62925	0.43674	2.422298	14.5315	0.000699
CAS	10.54786	9.69250	3.56514	1.18512	5.266560	142.5083	0.000000
C_I	54.65628	53.69559	11.48210	0.75743	4.107696	46.6639	0.000000
NIR_AvA	2.02964	1.94328	0.89806	0.89976	5.725426	141.3279	0.000000
NetL_TA	59.79471	62.18581	13.11525	-0.60250	2.947774	19.2756	0.000065
RGDPG	2.51007	2.67258	3.98888	-0.89773	4.818517	86.5317	0.000000
INFLR	3.71911	3.55687	2.14189	1.27725	6.491930	248.0273	0.000000
UNEM	9.94025	9.60000	3.42499	0.96394	3.277960	50.2708	0.000000
CRISIS	0.45283	0.00000	0.49855	0.18952	1.035920	53.0171	0.000000

According to the data of Table 1 it results the existence of relatively large variations of the variables such as Net Loans in total assets, cost to income ratio and the bad loans ratio, while for the other variables the variations were much smaller during 2004-2013 period. We also note that most of the high variations were registered during the period of economic and financial crisis, 2008-2012.

For the next part of our analysis we use Pearson correlations aiming to find out if there are any significant linkages between the evolution of the bad loans ratio and the considered determinants, but also their direction.

By processing the data for the 2004-2013 period, we have obtained the following results regarding the correlations between the bad loans ratio and the internal and external considered determinants, which are synthetized in Table 3.

Table 3. The correlation matrix of the considered variables, 2004-2013

Correlation/Probability Variable	NPLR	Log(TA)	CAS	C_I	NIR_AvA	NetL_TA	RGDPG	INFLR	UNEM
NPLR	1.0000 -----								
Log(TA)	-0.1621*** 0.0037	1.0000 -----							
CAS	0.1734*** 0.0019	-0.0947* 0.0917	1.0000 -----						
C_I	0.0739 0.1888	-0.2877*** 0.0000	-0.3840*** 0.0000	1.0000 -----					
NIR_AvA	-0.1275** 0.0229	-0.1689*** 0.0025	-0.0383 0.4960	0.2336*** 0.0000	1.0000 -----				
NetL_TA	-0.1027* 0.0675	-0.0861 0.1253	5.14E-05 0.9993	-0.1455*** 0.0094	0.0558 0.3208	1.0000 -----			
RGDPG	-0.3164*** 0.0000	-0.0725 0.1974	-0.0905 0.1071	0.1648** 0.0032	0.1491** 0.0077	-0.1951*** 0.0005	1.0000 -----		
INFLR	-0.1320** 0.0186	-0.1836*** 0.0010	-0.1817*** 0.0011	-0.0601 0.2851	0.1142* 0.0418	0.2364*** 0.0000	0.0804 0.1527	1.0000 -----	
UNEM	0.3029*** 0.0000	-0.1751*** 0.0017	0.1773*** 0.0015	0.2233*** 0.0001	0.0138 0.8057	-0.1760*** 0.0016	-0.0354 0.5294	-0.3780*** 0.0000	1.0000 -----
CRISIS	0.061347 0.2754	0.0757 0.1781	-0.015580 0.7820	-0.1883*** 0.0007	-0.1294** 0.0210	0.1861*** 0.0009	-0.3418*** 0.0000	0.1992*** 0.0004	-0.2189*** 0.0001

Notes: ***, **, * - denotes significance at 1%, 5%, respectively 10% level; 318 observations were included

Results presented in Table 3 are showing the existence of significant negative correlations of the ratio of bad loans with the internal determinants as bank size (coef. = -0.1621, prob. = 0.0037), the activity mix (coef. = -0.1275, prob. = 0.0229) and banks risk taking behaviour (coef. = -0.1027, prob. = 0.0675). These results are confirming the validity of H4 hypothesis, but, on the other hand, are rejecting the H1 and H3 hypotheses.

There are also shown significant negative correlations between the ratio of bad loans and external determinants as real GDP growth rate (coef. = -0.3164, prob. = 0.0000) and inflation rate (coef. = -0.2968, prob. = 0.0000), in accordance with the expected results. These results are suggesting that all these macroeconomic factors have negative influence on bad loans ratio and contribute to diminishing their volume, which confirms the H6 and H7 hypotheses.

On the other hand, there appear to be significant positive correlations between the ratio of bad loans and capital adequacy ratio (coef. = 0.1734, prob. = 0.0019) and unemployment rate (coef. = 0.3029, prob. = 0.0000) and less significant ones with cost inefficiency (coef. = 0.0739, prob. = 0.1888) all these factors appearing to have an impact of increasing the bad loans ratio and

contributing to the accumulation of such loans. While the result regarding unemployment rate is an expected one and confirms our H8 hypothesis, the result for capital adequacy appears to be contrary to our expectations and rejects the H2 hypothesis. On the other hand, even the significance level is above the maximum threshold of 10%, the resulted sign of the coefficient for the variable cost to income ratio is in line with our expectations and with H3 hypothesis.

We must however remark the positive significant correlation between the bad loans ratio and crisis manifestation, confirming the strong bidirectional linkage of them, while crisis fuels the accumulation of bad loans and the increase of bad loans ratio leads to a contraction of the credit market and thus deepens the crisis manifestation. This result is confirming, thus, the H9 hypothesis.

Results in Table 3 are also helpful for answering to a specific question regarding the possible endogeneity problems, due to the fact that unemployment impact economic growth, both of them being usually used as proxies for economic activity. However, the correlation matrix shows the negative correlation between real GDP growth and unemployment rate, but does not show a significant correlation of them.

We test further the proposed model (1) for determining the kind of the effects induced by the impact factors on the bad loans ratio, during the period 2004- 2013, in the case of the considered banks from Central and Eastern Europe. In order to avoid the possible endogeneity issues, we follow Petersen (2009) and use endogeneity robust estimators for testing our model with STATA 12. Moreover, we choose to analyse the fixed effects of the independent variables in order to catch more accurately their action and we test progressively the variables in order to see if their effects remain significant both when testing them separately or their entire group. The tests lead us to the results presented in Table 4:

Table 4. Results of testing the determinants of bad loans ratio using a robust fixed effects OLS, 2004-2013

Dependent Variable: NPLR							
Cross-sections included: 38				**Model**			
Total panel observations: 318				**Coefficient/Probability**			
Variable	**Test 1**	**Test 2**	**Test 3**	**Test 4**	**Test 5**	**Test 6**	**Test 7**
LOG(TA)	5.961275	3.342861	5.812723	3.103265	5.007398	3.807732	3.881755
	0.002	0.052	0.006	0.060	0.008	0.052	0.043
CAS	0.688412	-0.507017	0.229199	0.337075	0.173191	0.726638	0.124099
	0.031	0.082	0.354	0.205	0.457	0.748	0.580
C_I	0.130537	-0.141838	0.105233	0.143277	0.122822	0.114630	0.125769
	0.188	0.127	0.249	0.111	0.165	0.183	0.148
NIR_AvA	-2.912532	-2.392201	-2.841843	-2.355542	-2.5642	-2.534291	-2.396519
	0.011	0.031	0.004	0.036	0.010	0.011	0.015
NetL_TA	-0.373196	-0.035362	-0.152669	-0.326175	-0.177374	-0.163399	-0.181959
	0.000	0.031	0.089	0.000	0.038	0.045	0.026
RGDPG		-0.500856		-0.384073		-0.308787	-0.244249
		0.000		0.000		0.004	0.007
INFLR				-0.817711	0.631267	-0.5021167	-0.564212

Dependent Variable: NPLR							
Cross-sections included: 38				Model			
Total panel observations: 318				Coefficient/Probability			
Variable	**Test 1**	**Test 2**	**Test 3**	**Test 4**	**Test 5**	**Test 6**	**Test 7**
				0.000	0.000	0.001	0.000
UNEM			1.053786		0.918533	0.794079	0.822716
			0.000		0.000	0.000	0.000
CRISIS				1.08484	2.019773		1.452294
				0.092	0.004		0.010
C	-74.14527	-31.36423	-89.3146	-25.2242	-72.93644	-50.42679	-52.82155
	0.026	0.295	0.008	0.379	0.015	0.114	0.088
R-squared	0.2610	0.3409	0.4093	0.3961	0.4569	0.4619	0.4724
F-statistic	5.78	27.92	10.02	31.73	38.04	27.82	40.18
Prob (F-statistic)	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

The tests revealed that all the macroeconomic variables that keep having the same significant effects on the bad loans ratio even if they are tested separately or with the entire group of independent variables, which, corroborated with the use of robust estimators, sustain both the idea that there are no visible endogeneity issues.

According to the data in Table 4 it results that the model tested by using all the variables has a good degree of viability (R-squared = 0.4724, Prob (F-statistic) = 0.0000), which confirms that the dependent variable bad loans ratio is relevantly determined by the independent variables.

The data in Table 4 are confirming most of the correlations identified before. Thus, the internal determinants, namely activity mix (coef. = -2.3965, prob. = 0.015) and bank risk taking behaviour (coef. = -0.1819, prob. = 0.026) appear once again to have a negative impact, statistically significant under the threshold of 5% on the bad loans ratio. Therefore we can draw as a first conclusion that for the banks in Central and Eastern Europe the diversification of the activity contributes to limiting the proportion of bad loans, which confirms our H4 hypothesis. On the other hand, it appears that banks behaviour of granting more loans to their customers leads also to a decrease of the proportion of bad loans, even if, under such circumstances, banks are assuming new risks, which can be explained by the fact that in time, the increase of the total loans was higher than the increase of the bad loans. In the end, results lead to rejecting our H5 hypothesis and are in line with some previous studies (Khemraj and Pasha, 2009; Nkusu, 2011; Filip, 2015).

On the other hand, results show that capital adequacy ratio (coef. = 0.1241, prob. = 0.580) and cost inefficiency (coef. = 0.1258, prob. = 0.148) are positively influencing the bad loans ratio increase, which also corresponds to the results from correlation analysis, but the significance of their linkages changed. Thus, the cost inefficiency, proxied by cost to income ratio, appears to have now a positive even if statistically insignificant impact on the dependent variable, which confirms the H3 hypothesis and is in line with previous studies (Chaibi and Ftiti, 2015). At the same time, capital adequacy appears to have an insignificant positive impact, as in

other studies (Fofack, 2005; Khemraj and Pasha, 2009), and thus the H2 hypothesis is rejected.

The variable bank size results to have a statistically significant positive impact (coef. = 3.8818, prob. = 0.043) on the ratio of bad loans, both in terms of coefficient and in term of probability, suggesting that bigger banks have problems to administrate their portfolio of loans and fail to prevent the accumulation of bad loans, possibly due to the higher number and value of the loans granted by them, which is in line with former other studies (Khemraj and Pasha, 2009). As consequence our H1 hypothesis is confirmed.

Results regarding real GDP growth rate (coef. = -0.2442, prob. = 0.007) and inflation rate (coef. = -0.5642, prob. = 0.000) show that these macroeconomic independent variables have also statistically significant impacts on the bad loans ratio, which confirm the correlations observed previously in Table 3. We note, thus, that our hypothesis H6 on the impact of real GDP growth on bad loans ratio is confirmed by the obtained result and this is in line with the results of previous other studies (Bofondi and Ropele, 2011; Louzis, Vouldis and Metaxas, 2012; Erdinc and Abazi, 2014). On the other hand, it is confirmed also our H7 hypothesis regarding the impact of inflation on the dependent variable, which is also in line with some of the previous papers (Nkusu, 2011; Klein, 2013, Erdinc and Abazi, 2014).

The other macroeconomic independent variables considered in our model, unemployment rate (coef. =-0.8227, prob. = 0.000) and the crisis manifestation (coef. = 1.4523, prob. = 0.010) appear to have statistically positive impact on the bad loans ratio, favouring the increase of this kind of loans and confirming the previous correlation results. Under these circumstances, we conclude that our hypothesis H8 is sustained by the results regarding the impact of unemployment on the dependent variable, which are also in line with the conclusions of other studies (Louzis, Vouldis and Metaxas, 2012; Chaibi and Ftiti, 2015, Anastasiou, Louri and Tsionas, 2016). Moreover, also the H9 hypothesis is confirmed and the effects of the financial and economic crisis manifestation on bad loans ratio are in line with the observations from previous papers (Erdinc and Abazi, 2014; Beaton, Myrvoda, and Shernnel, 2016).

Based on the results, we can conclude, first, that in the analysed banks from Central and Eastern Europe there are both internal and macroeconomic factors that have a significant impact on keeping the bad loans ratio low. Reasonably, real GDP growth improves the repayment capacity of the borrowers and also inflation appears to help reimbursements by diminishing the real value of a loan. Complementary, the banking risk taking behaviour appears also to contribute to reducing the bad loans ratio, based on a more rapid increase of the volume of the total loans than that of the bad loans. Moreover, by bringing other revenues for the banks, the activity mix makes banks to practice a less risky lending activity and prevents so the appearance of new bad loans.

On the other hand, we must note that there is a strong impact on increasing the bad loans ratio generated by the manifestation of the economic and financial crisis, in general, and particularly through the increase of unemployment, which can be amplified also by internal factors. Results show that bigger banks have a higher bad loans ratio, which can be explained by the difficulty of administrating higher volumes and numbers of loans. Moreover, the higher the increase of cost to income ratio, signalling the inefficiency of banks expenses appears to lead to an increase in the bad loans ratio, while the efforts of the banks to recover the loans imply high costs, but lead to a low recovery rate. At the same time, for the banks which were analysed it results that the capital adequacy has an insignificant, yet positive effect on bad loans ratio.

Conclusions

This study has started from the premise that there exist strong interdependencies between the banking systems' functioning and the performance of the economy and therefore the malfunction of each of them has echo in the malfunctioning of the other one. That is why when things start to go wrong for the banks and the crisis appears in the banking system it usually leads to the crisis of the entire economy, these phenomenon of the twin crisis being observed also during the most recent financial and economic crisis.

Based on the previous considerations our study brings to attention the necessity of identifying and analysing the determinants of the bad bank loans, while the increasing proportion of such loans is the most relevant indicator of a crisis at bank level, affecting the banks' performance and leading to worsening of the economy status.

Starting from the existing literature we have chosen the bad loans ratio as proxy for estimating the proportion of the bad loans and we identified first the major categories of impact factors consisting in the internal ones, respectively the macroeconomic ones. We have selected as internal determinants for our analysis the variables bank size, capital adequacy, cost inefficiency, activity mix and bank risk taking behaviour. We also considered macroeconomic determinants such as real GDP growth, inflation rate and unemployment rate. At the same time, we took into consideration supplementary the potential impact of the financial and economic crisis manifestation on the accumulation of bad loans.

Our analysis is developed by processing the annual data of 38 of the most representative banks from Central and Eastern Europe for the period 2004-2013, using econometric methods. In this context, we used first Pearson correlations between the considered variables which has led us to results confirming expected significant positive linkages of bad loans ratio with determinants like cost to income ratio, unemployment and crisis, but also significant negative linkages of bad loans ratio with bank size, activity mix, bank risk taking behaviour, real GDP growth and inflation.

We have gone further with our analysis by building a regression model using as dependent variable the bad loans ratio and the other indicators as independent variables. By testing this model on the data of the data panel for the considered banks using Panel Least Squares Fixed Effects Method, we found out that the main determinants of the increase in bad loans ratio appear to be bank size, the manifestation of the economic and financial crisis, unemployment and the cost to income ratio, which are enhancing the accumulation of bad loans. On the other hand, activity mix, bank risk taking behaviour and especially real GDP growth and inflation proved to have significant effects against the formation of bad loans, limiting or even decreasing the level of their ratio.

These empirical results can serve for learning some important lessons from the experience of the banks in Central and Eastern Europe which may be useful for the future. Banks may prevent the bad loans accumulation or diminish their bad loans ratio by taking care of the management of their costs and by enhancing the activity mix. They also need improving their risk taking behaviour, granting more loans to the customers but without relaxing too much their lending conditions and procedures or cutting the costs implied by the necessary control of the ongoing or, especially, overdue loans, which will need investments in departments for following and recovering the granted loans. On the other hand, the governments who need banking systems properly functioning should focus, in our opinion, especially on encouraging employment as base for improving the borrowers' repayment capacity and of generating GDP growth.

References

Anastasiou, D., Louri, H. and Tsionas, M. (2016), Determinants of Non-Performing Loans: Evidence from Euro-Area Countries, *Finance Research Letters*, 18, pp. 116-119.

Beaton, K., Myrvoda, A. and Shernnel, T. (2016), *Non-Performing Loans in the ECCU: Determinants and Macroeconomic Impact*, IMF Working Paper WP/16/229.

Berger, A. N. and DeYoung, R. (1997), Problem Loans and Cost Efficiency in Commercial Bank, *Journal of Banking & Finance*, 21(6), pp. 849-870.

Bofondi, M. and Ropele, T. (2011), *Macroeconomic determinants of bad loans: evidence from Italian Banks*, Questioni di Economia e Finanza, Bank of Italy Occasional Paper No. 89, pp. 1-40.

Castro, V. (2013), Macroeconomic Determinants of the Credit Risk in the Banking System: The Case of the GIPSI, *Economic Modelling*, 31, pp. 672-683 (retrieved from http://dx.doi.org/10.1016/j.econmod.2013.01.027).

Chaibi, H. and Ftiti, Z. (2015), Credit risk determinants: Evidence from a cross-country study, *Research in International Business and Finance*, 33(2015), pp. 1-16

Ennis, H. and Malek, H. (2005), *Bank risk of failure and the too-big-to-fail policy*, Federal Reserve Bank of Richmond Economic Quarterly, 91(2), 21-44.

Erdinc, D. and Abazi, E. (2014), The Determinants of NPLs in emerging Europe, 2000-2011, *Journal of Economics and Political Economy*, 1(2), pp. 112-125.

Espinoza, R. and Prasad, A. (2010), *Non-performing Loans in the GCC Banking System and their Macroeconomic Effects*, IMF Working Paper WP/10/224.

Filip, B.F. (2014), Non-performing loans - dimension of the non-quality of bank lending/loans and their specific connections, *Theoretical and Applied Economics*, 5(594), pp. 127-146.

Filip, B.F. (2015), *Determinants of Non-performing Loans in Western European Countries*, Proceedings of the International Conference on Euro and the European Banking System - Evolutions and Challenges, pp. 146-155 (retrieved from http://www.ebip-eu.uaic.ro/?page_id=1741).

Fofack, H. (2005), *Nonperforming Loans in Sub-Saharan Africa: Causal Analysis and Macroeconomic Implications*, World Bank Policy Research Working Paper No. 3769.

Hu, J., Yang, L. and Yung, H. C. (2004), Ownership and Non-Performing Loans: Evidence from Taiwan's Banks, *Developing Economies*, 42, pp. 405-420 (retrieved from http://dx.doi.org/10.1111/j.1746-1049.2004.tb00945.x).

Kaminsky, G. and Reinhart, C. (1999), The Twin Crises: the Causes of Banking and Balance of Payments Problems, *The American Economic Review*, 89(3), pp. 473–500

Khemraj T. and Pasha, S. (2009), *The determinants of non-performing loans: an econometric case study of Guyana,* The Caribbean Centre for Banking and Finance Bi-annual Conference on Banking and Finance, St. Augustine, Trinidad (retrieved from http://mpra.ub.uni-muenchen.de/53128/).

Kjosevski, J. and Petkovski, M. (2017), Non-performing loans in Baltic States: determinants and macroeconomic effects, *Baltic Journal of Economics*, 17(1), pp. 25-44.

Klein, N. (2013), *Non-Performing Loans in CESEE: Determinants and Impact on Macroeconomic Performance,* IMF Working Paper WP/13/72.

Louzis, D. P., Vouldis, A. T. and Metaxas, V. L. (2012), Macroeconomic and Bank-specific Determinants of Nonperforming Loans in Greece: A Comparative Study of Mortgage, Business, and Consumer Loan Portfolios, *Journal of Banking & Finance*, 36, pp. 1012–1027

Nkusu, M. (2011), *Nonperforming Loans and Macrofinancial Vulnerabilities in Advanced Economies*, IMF Working Paper No 11/161.

Petersen, M. A. (2009), Estimating standard errors in finance panel data sets: Comparing approaches, *Review of Financial Studies*, 22(1), pp. 435-480.

Podpiera, J. and Weill, L. (2008). Bad Luck or Bad Management? Emerging Banking Market Experience, *Journal of Financial Stability*, 4, pp. 135-148 (retrieved from http://dx.doi.org/10.1016/j.jfs.2008.01.005).

Salas, V. and Saurina, J. (2002), Credit risk in two institutional regimes: Spanish commercial and savings banks, *Journal of Financial Services Research*, 22, pp. 203–224.

Škarica, B. (2014), Determinants of non-performing loans in Central and Eastern European countries, *Financial theory and practice*, 38(1), pp. 37-59.