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EXPLORING THE FACTORS LEADING TO LOAN DELINQUENCY

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Abstract

This study explores an empirical approach to detect the determinants of problem loans for a sample of 135 European banks. We focused on banks belonging to the countries most affected by the 2008 financial crisis, namely Spain, Greece and Italy. Inspired by the pioneering works, we chose bank-specific factors and macroeconomic factors as determinants of bad loans. Our result shows that non-performing loans depend positively on unemployment rates, inflation rates and loan loss provisions. These problem loans vary negatively on GDP growth rates and return on equity.

1. Introduction

The deterioration in the quality of banks ' credit portfolios has been the main cause of difficulties in banking systems and economic and financial crises in developed economies (Dash & Kabra, 2010; Nkusu, 2011). Indeed, the increase in mortgage defaults in the United States highlights the links between macroeconomic and financial shocks as well as the relationship between credit market frictions and the risk of financial instability. Non-performing loans have been widely used as a measure of the asset quality by credit institutions and have often been associated

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with the presence of bankruptcy risk and financial crises, both in developed and developing countries . They are considered a statistically significant leading indicator of insolvency (Lanine & Vennet, 2006). Most banking institutions often have a high level of bad debts before the distress period . Non -performing loans are among the main causes of economic stagnation problems (Nkusu , 2011) . The presence of these problem loans in a financial sector increases the possibility of having a company in difficulty and unprofitable . In this case , the " irradiation " of NPLs is a sine qua non condition for improving the economic situation . If problem loans are present and kept permanently , they will have an impact on the resources that will be locked up in unprofitable sectors . Thus, they are likely to hinder economic growth and reduce economic efficiency.

Financial system shocks can emanate from macroeconomic imbalances , i.e. systemic shocks . In general, research adopted on developed economies has confirmed that macroeconomic conditions affect credit risk (Jimenez & Saurina, 2006; Bofondi & Ropele, 2011).

At the beginning, this research work aims to know the explanatory factors of the quality of credits granted by the bank, more precisely the doubtful debts in order to be able to supervise them. These factors can be macroeconomic variables or specific to the bank.

The remainder of this paper is organized as follows: the second section discusses the existing literature on the determinants of NPLs, namely macroeconomic and bank-specific variables and the effect on loan quality . The third section describes the data used and the methodology. The fourth section

interprets and analyzes the empirical results. Finally, the conclusion will be the subject of the fifth section.

2. Literature review

In recent years , the literature examining non- performing loans (NPLs) has attracted the attention of several researchers, especially the interest given to understanding the factors responsible for financial vulnerability . This vulnerability can be attributed to the role played by impaired assets as evidenced by the strong association between NPLs and financial crises. Indeed, Sorge (2004) advocates the use of such variables (non - performing loans and loan loss provisions) in stress tests in order to assess the vulnerability of the financial system .

Nkusu (2011) classifies the work into three parts :

The first strand of literature has focused on explaining NPLs in financial institutions across countries highlighting the role of macroeconomic performance , management quality, and policy choices (Dash & Kabra, 2010; Espinoza & Prasad , 2010; Louzis, Vouldis, & Metaxas, 2011) .

The second part of the literature analyzes the link between NPLs and macro-financial conditions by highlighting the positive impact of NPLs on the probability of crisis and subsequently the key role played by these NPLs in predicting banking crises (Caprio & Klingebiel , 1996 ; Kaminsky & Reinhart , 1999) .

The third branch of literature focuses on explaining or predicting NPLs at the macroeconomic level . These aggregates can refer either to the total outstanding loans in an economy or to certain types of loans (Pesola, 2007;

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Jappelli, Pagano, & Marco, 2008; Nkusu, 2011).

Therefore , the factors may be related to the environment macroeconomic or bank - specific .

2.1. Macroeconomic factors

The relationship between the macroeconomic environment and loan quality has been studied in the literature linking the phase of the business cycle with banking stability . The expansion phase of the economy is characterized by a relatively low number of bad loans, since consumers and businesses hold enough income and revenues to cover their debts within the pre - established maturities .

If the euphoria phase continues , credit is granted without taking into account the quality of the debts. However, when the recession period sets in, an increase in doubtful debts is often a corollary.

In general, theoretical models of the business cycle with an explicit financial role provide a good basis for modeling NPLs because they emphasize the cyclical nature of the credit risk meter and corporate failures (Williamson, 1987).

The academic literature provides evidence that suggests a strong association between NPLs and several macroeconomic factors (Salas & Saurina, 2002; Chase, Greenidge, Moore, & Worrell, 2005; Festic & Beko, 2008; Khemraj & Pasha, 2009; Ali & Daly, 2010). The latter that the literature proposes as important determinants are: annual GDP growth, credit growth, real interest rate, annual inflation rate, real exchange rate, annual unemployment rate, money supply (M2) and GDP by capital, etc.

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Festic & Beko (2008), examining the importance of macroeconomic variables on non-performing loans in Hungary and Poland, pointed out that the improvement in economic conditions has led to improved banking sector performance in both economies. The authors used the vector autoregressive (VAR) method to examine the impulse responses of macroeconomic variables on non-performing loans.

The macroeconomic environment influences borrowers' balance sheets and their borrowing capacity. A growing economy is conducive to higher incomes and lower financial distress. Consequently , real GDP growth and employment are negatively associated with NPLs. Conversely, unemployment is positively related to NPLs. Several empirical studies have found a negative relationship between real GDP growth and NPLs (Salas & Suarina, 2002; Rajan & Dhal, 2003; Fofack, 2005, and Jimenez & Saurina, 2006). The explanation provided by the literature for this relationship is that strong positive real GDP growth usually translates into higher income that improves the borrower's repayment capacity. The latter thus helps to reduce non-performing loans. Conversely , when there is a slowdown in the economy (slow or negative GDP growth) the level of bad loans is expected to increase.

Along the same lines, the interest rate affects the amount of bad debts in the case of variable rate loans. This implies that the effect of the interest rate should be positive, and as a result, there is an increase in debt caused by the increase in mortgage payments.

interest rate which will consequently lead to higher growth of non -performing loans (Bofondi & Ropele, 2011). Lawrence (1995) examines such a model and

explicitly introduces the probability of default. The model implies that low - income borrowers have higher default rates . This is explained by their increased risk of unemployment, which makes them unable to meet their commitments. It should also be noted that banks charge higher interest rates to riskier clients. Fofack (2005) argues that economic growth and the real interest rate are important determinants of non-performing loans in sub-Saharan African countries . The author attributes the strong association between macroeconomic factors and non-performing loans to the undiversified nature of some African economies and their high exposure to external shocks.

Jimenez & Saurina (2006) examine the Spanish banking sector from 1984 to 2003 , they provide evidence that NPLs are determined by GDP growth , real interest rate and easy credit conditions . Based on their model, Khemraj & Pacha (2009) attempt to find the determinants of NPLs in the Guyanese banking sector . They found that the real effective exchange rate has a significant positive impact on NPLs.

This indicates that whenever there is an appreciation of the local currency, commercial banks' NPL portfolios are likely to be high. Their empirical results show that GDP growth is inversely related to NPLs, suggesting that GDP improvement translates into the real economy through lower NPLs . They also found that banks that charge relatively high interest rates and overlend are likely to incur high levels of non-performing loans.

Among the authors who have confirmed that adverse macroeconomic developments are associated with the increase in NPLs, one can cite the example of the research carried out by Chase, Greenidge, Moore, & Worrell,

2005; Shu, 2002; Khemraj & Pasha, 2009; Bofondi & Ropele, 2011.

Shu (2002) examined the case of Hong Kong banking institutions between 1995Q1 and 2002Q2 and found that unemployment affects people's ability to repay their debt, and inflation has led to an erosion of the real value of repayment.

Bofondi & Ropele (2011) opted for a work on conventional banks in Italy. They analyzed the relationship between the quality of loans and the nature of borrowers. In accordance with their analysis , macroeconomic variables can affect two categories of borrowers differently, namely individuals and companies.

Bofondi & Ropele (2011) examine the macroeconomic determinants of the quality of bank loans in Italy over the period 1990Q1-2010Q2 , as measured by the ratio of new non-performing loans to outstanding loans in the previous period . According to these authors, the quality of loans to households and firms can be explained by a small number of macroeconomic variables mainly concerning the general state of the economy, the cost of borrowing and the debt burden . However, changes in macroeconomic conditions affect the quality of loans.

-generally affect loan quality. Similarly, Nkusu (2011) and Klein (2013) showed the effect of inflation rate on loan quality. According to Klein (2013), the impact of inflation, however, can be ambiguous. On the one hand, inflation can make lending an easy task by reducing the real value of outstanding loans , but on the other hand, it can also reduce borrowers' real income when wages are sticky. In countries with variable lending rates , higher inflation can also

lead to higher rates resulting from monetary policy measures to combat inflation (Nkusu, 2011) .

As for Louzis, Vouldis, & Metaxas (2011), they use the dynamic panel data method to examine the determinants of NPL in the Greek banking sector , separately for each type of loan (consumer, corporate , and mortgage). A set of fundamental macroeconomic indicators , more precisely, the real GDP growth rate , the unemployment rate , and the real interest rate (corresponding to each type of loan) are studied. They use a dataset of nine large Greek banks for the period 2003 to 2009.

The results show that non-performing loans in the Greek banking system can be explained mainly by macroeconomic fundamentals (GDP, unemployment rate) and management quality.

Mortgage NPLs are the least sensitive to macroeconomic conditions. This result is consistent with that found by Espinosa & Prasad (2010). Indeed , for a sample of 80 banks in the Gulf Cooperation Council (GCC) region for a fourteen-year period from 1995 to 2008 , they found that the NPL ratio worsens as economic growth becomes weaker , interest rate and risk aversion increase. Their model implies that the cumulative effect of macroeconomic shocks over a three-year horizon is indeed significant.

2.2. Bank - specific factors

In addition to macroeconomic variables, there are several empirical works that suggest that bank-specific factors (such as institution size , profit margins , efficiency, profitability, credit terms (maturity and interest), risk profile, and

market power) are important determinants of NPLs, as they can cause risky lending. Macroeconomic indicators are included mainly as control variables and are therefore treated as exogenous (Jimenez & Saurina, 2006; Quagliariello, 2007). The effect of bank size on the NPL ratio is mixed. A negative relationship between the NPL ratio and bank size may mean that large banks have the ability to employ better risk management strategies, and therefore will have a low level of NPLs compared to small banks. Bank size indicates a higher probability of having a diversified loan portfolio , thus reducing risks and a higher probability of obtaining target returns. However, larger banks may take more risks, which increases the magnitude of non-performing loans, leading to a positive relationship between size and NPLs (Khemraj & Pacha, 2009). Lis, Pages, & Saurina (2000), Salas & Saurina (2002) find a negative correlation between bank size and NPLs.

Hu, Li, & Chiu (2004) who studied the banking sector of Taiwan .

The study covered the period from 1996 to 1999. They also found a negative relationship between bank size and the rate of non - performing loans. The same result is obtained by Salas & Saurina (2002) for Spanish banks over a period from 1985 to 1997.

Some authors have used bank profitability to explain the risky behavior of managers .

Mismanagement may then imply weak monitoring of both operating costs and the quality of loans granted, and this is expected to induce high levels of capital losses. Managerial inefficiency may also positively affect NPLs . Analyzing the context of the Czech banking sector for the period 1994-2005 ,

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Podpiera & Weill (2008) concluded that there is strong evidence that inefficiency is positively associated wit in non-performing loans. The authors argue that regulatory authorities should focus on managerial performance in order to improve the stability of the financial system. The same result was found by Louzis, Vouldis, & Metaxas (2011) for the case of Greek banks.

Similarly, Godlewski (2004) showed that the impact of bank profitability is negative on the level of non - performing loan ratio . Kolapo, Ayendi, & Oke (2012) studied the relationship between bank performance and credit risk management . Their result shows that profitability measured by return on assets (ROA) negatively affects non -performing loans of financial institutions .

Boudriga, Boulila, & Jellouli, (2009) examine the determinants of non-performing loans and the impact of the supervisory environment for a sample of 59 countries over the period 2002-2006. The authors found an association between non-performing loans and specific bank variables such as return on assets.

Loan losses are a central factor affecting the performance of credit institutions (Pesola, 2007). Indeed, banks that anticipate high levels of capital losses may create higher provisions to reduce earnings volatility and strengthen their solvency in the medium term. Managers may also use loan loss provisions to signal the financial strength of their banks because a bank's willingness to create loan loss provisions is considered a strong belief in its future performance (Ahmad, Takeda, & Thomas, 1999). Ahmed, Takeda & Shawn (1998) in their study revealed that loan loss provisions have a significant positive influence on non-performing loans. Therefore, an increase in loan loss

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provisions indicates an increase in credit risk and deterioration in loan quality, thereby affecting the bank's performance negatively.

Fisher, Gueyie & Ortiz (2001) find similar results with LLP

the worsening of public finances. We then opted for a selection of large banks with a significant amount of classified debts . The choice of these three countries is then motivated by the fact that the number of bank defaults in these countries has been very high in recent years. They were hit hard by the subprime crisis and then by the over-indebtedness crisis. It goes without saying that Greece has harmed the entire European financial and monetary system.

3.2. Presentation of the model

In order to empirically concretize this study, both macroeconomic and financial variables were used. The macroeconomic data are collected from World Development Indicators & Global Development Finance. As for the bank - specific data , the Bankscope database was used.

So in this study, we integrated three macroeconomic variables and other specific ones relating to the size of the bank, the performance of equity, the provisions for loan losses.

$$PNP_{i,t} = \beta_0 + \beta_1 \Delta PIB_{j,t-1} + \beta_2 INF_{j,t} + \beta_3 CH_{j,t} + \beta_4 TA_{i,t} + \beta_5 ROE_{i,t} + \beta_6 LLP_{i,t} + \varepsilon_{i,t} \quad (1)$$

NPL: represents the ratio of bad debts to total loans for bank i in year t.

$\Delta PIB_{j,t-1}$: represents the annual growth of real GDP of country j at time t-1.

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CH j , t : the unemployment rate of country j at time t .

INF j , t : the annual inflation rate of country j at time t.

TA i, t : the size of bank i for year t ,

$ROE\ i_{,t}$: the rate of return on equity of bank i at time t .

LLP : Loan loss provisions divided by total loans .

Table 1- The definition of variables **Variables Definition Expected sign**

ΔG DP	1					
INF	0.400***	1				
CH	-0.208***	-0.026	1			
YOUR	0.004	0.136***	0.316***	1		
ROE	0.326***	0.001	-0.182***	0.081**	1	
LLP	-0.062*	0.049	0.107***	-0.062*	-0.263***	1

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The ratio of non -performing loans to

positively correlated with risk for banks in NAFTA countries. This relationship is verified for the different banking systems . This

PNP

total loans for year t .

the bank i to

same result is obtained by Ahmad(2003) regarding Malaysian banks showing similar results when their LLP is positively and significantly related to credit risk.

Bank-specific variables considered to affect non-performing loans also include credit growth measured by the percentage change in each bank's loan portfolio. The literature shows that rapid credit growth is often associated with bad loans (Salas & Saurina, 2002 ;

ΔPIB The annual growth of real GDP (GDP) at time t

INF Inflation rate : growth rate of the consumer price index (CPI)

TA Size is approximated by the log of total active

(-) (+)

(-)

Jimenez & Saurina, 2006 ; Khemraj & Pacha, 2009 and Dash & Kabra, 2010)

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. The increase in credits is explained by herd behavior and agency problems that could encourage bank managers to lend excessively during periods of crisis

3. Presentation of the sample, model and result analysis

3.1. The sample

The sample consists of 135 banks in three countries (Italy, Greece and Spain) for a period of six years (from 2006 to 2011). The choice of the three countries is not random since it presents a representative sample of countries that had problems after the 2008 crisis and

ROE Net profit / equity (-)

LPP The ratio of loss provisions on

loans to total loans (+)

4. Analysis and interpretation of results

The application of multiple regression models requires the absence of multicollinearity between the independent (exogenous) variables . This problem leads to poor estimates of the coefficients α i . A bivariate multicollinearity problem arises when two independent variables are highly correlated. Table 2 presents the coefficients of Pearson correlations of the different exogenous variables appearing in our model.

Table2- The Pearson correlation matrix

The correlation coefficients between the different explanatory variables are low .

Multivariate multicollinearity, on the other hand, arises when several

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independent/exogenous variables are correlated. The results of the tests that were carried out show the absence of a multivariate multicollinearity problem. Indeed, no tolerance indicator of a variable was identified that was lower than the limit of 0.25. In addition, all the VIF values identified are lower than the limit drawn by Fox (1991) namely 4. The last eigenvalues are not very close to 0 and the conditioning indices are all lower than 30. These findings confirm the absence of a multivariate multicollinearity problem.

The Hausman test (1978) is used to determine whether the coefficients of the two estimates (fixed and random) are statistically different. The idea of this test is that under the null hypothesis of independence between the errors and the explanatory variables, the two estimators are unbiased and the estimated coefficients are identical. The result of this test is a Chi-2 distribution with K-1 degrees of freedom. If the null hypothesis cannot be rejected, that is, if the value of the $\chi 2$ statistic is less than the theoretical value, the random effects will be used. The results of the Hausman test indicate that the fixed effect is preferred to the random effect.

Table 3 - Regression estimation of the determinants of non- recurring loans

efficient

Variables	Coefficients	t-student
ΔGDP	-	- 2.48

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	0.1168417**	
INF	0 .2529456**	2.46
CH	0.3272536***	7.61
YOUR	- 0.4329589	- 0.69
ROE	- 0.1048454***	- 7.80
LLP	0.4121852***	9.13
Cst	9.23439	0.96

R^2 0.9261

F 2.99

(***), (**) and (*) Coefficients significant at a threshold of 1%, 5% and 10% respectively.

Quite consistent with the theory, the results found confirm a significant negative relationship between GDP growth rate and non- performing loans (Salas & Suarina , 2002 ; Rajan &Dhal,

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The dynamics of the two variables (GDP growth rate and unemployment rate) is closely related to households and firms and the ability to meet their financial obligations. An increase in GDP generally reflects larger income flows for households and an increase in the profitability of firms. An increase in the unemployment rate limits the current and future purchasing power of households and is generally linked to a decrease in the production of goods and services. Unemployment negatively affects household cash flows and increases the debt burden. As for firms, the increase in unemployment could cause a decrease in production following the decrease in effective demand . This can lead to a decrease in income and a fragile debt situation. In this work, the results are similar to those obtained by Louzis, Vouldis, & Metaxas (2011) for the case of Greek banks and Bofondi & Ropele (2011) concerning Italian banks.

Our results also demonstrate that the inflation rate positively affects problem loans. This result is significant at the 1% level. Inflation can reduce borrowers' real income when wages are rigid and also allows the erosion of the real value of repayment. This result is similar to those obtained by Khemraj & Pacha (2009) and Dash & Kabra (2010) and Nkusu (2011).

Our results demonstrate the absence of a significant relationship between bank size and non-performing loans. The sign obtained is the expected one, namely the negative effect of size on bad debts. This result is similar to that of Khemraj & Pacha (2009).

A negative and significant relationship at the 1% level was also found between return on equity and the amount of NPLs . Indeed, a bank with high

profitability has less incentive to generate revenue and therefore less constrained to engage in risky activities such as granting risky loans. On the contrary, inefficient banks are forced to grant loans deemed risky and subsequently experience high levels of NPLs. Return on equity contributes to lower NPLs and suggests that better managed banks have, on average, better asset quality. These results were also obtained by Godlewski (2004) and Ali (2013).

Regarding the relationship between the loan loss provisions variable and non - performing loans, it is positive and significant at the 1% level . Banks that anticipate high levels of capital losses could create higher provisions to reduce earnings volatility and strengthen their solvency in the medium term . This result is similar to that of Fisher, Gueyie and Ortiz (2001).

5. Conclusion

In this work, an attempt was made to detect the factors that impact non-performing loans at the level of banking institutions. The study focused on a sample of European banks .

located in Italy, Greece and Spain. The results demonstrate that GDP growth and the profitability of equity of credit institutions have a negative impact on bad debts, while the inflation rate , the unemployment rate and the provisions for loan losses affect it positively. These results demonstrate the importance of macroeconomic factors and bank- specific variables in the stability of the financial system.

The results obtained affirm that commercial banks should pay attention to several factors when extending loans in order to limit the level of bad loans .

Specifically , commercial banks should consider the international competitiveness of the national economy, because if this competitiveness is not at a good level, it could harm the ability of borrowers in key export sectors to repay their debts. These credit institutions should also consider the performance of the real economy when extending loans since non-performing loans are likely to be higher during periods of economic slowdown.

Banks should similarly expand its macroeconomic surveillance framework to include prudential indicators such as GDP to assess the stability and soundness of the banking system .

As with any research work, this study has some limitations. For example, other macroeconomic variables could have been used such as the real effective exchange rate, the money supply and other bank-specific variables (the loan growth rate or liquidity). The work could also have been extended by decomposing non-performing loans by type of credit (Louzis, Vouldis, & Metaxas, 2011). Other econometric methods can be used such as the dynamic panel or the PVAR (panel vector autoregressive) method (Klein, 2013) and the effect of macroeconomic shocks on the level of non- performing loans can be determined and subsequently the resilience of credit institutions to these shocks can be measured.

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