

## Determinants of Impaired Loans and Doubtful Loans in Italy\*

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**Abstract:** The work aims to investigate the incidence of banks' size and financial and macroeconomic indicators on the ratio of impaired loans to gross loans and on the ratio of doubtful loans to total asset. The financial indicators are return on average assets and cost income ratio, as indicators of profitability and efficiency of the bank, while macroeconomic indicators are the inflation rate and the unemployment rate. The study focuses on Italian banks over the period 2008-2014, these are crisis years in which the incidence of impaired loans has grown considerably. The analysis is conducted on a sample composed of 60 Italian banks, divided into 20 joint stock banks, 20 cooperative banks and 20 popular banks. The analysis method is based on multivariate panel regressions models. The empirical analysis shows that the ratio of impaired loans to gross loans and the ratio of doubtful loans to total asset are negatively related to return on average assets and to banks' size. Therefore, these two variables exert a positive influence on loan quality. The ratio of impaired loans to gross loans is also negatively related to the cost income ratio. Regarding the macroeconomic determinants, results point out that there is a positive relationship between the unemployment rate and both dependent variables. The unemployment rate exerts a negative influence on loan quality.

**Key words:** bank; doubtful loans; impaired loans; non-performing loans

**JEL codes:** G20, G21

### 1. Introduction

The international literature has often debated the issue of banks' risk, drawing attention of practitioners and experts on the quality of bank loans. As a result of the recent financial crisis, the issue has become even more relevant and serious.

From the 2007, the crisis has been affecting the financial markets and the real economy and has been generating an increasing amount of non-performing loans (NPLs) into the European banks' financial statements. At the end of the 2014, the amount of NPLs reached a level equal to 350 billion euro.

During the crisis, the worsening of the credit quality has been affecting, in different ways, all the European banks.

The Italian banking industry seems to be the most affected, with one of the highest level of NPLs.

During the last seven years, the Italian real economy has been suffering two recessionary phases, which have

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been creating a significant increase of NPLs, climbing to a record level.

In December 2014, the amount of Italian banks' NPLs was about 350 billion Euro, corresponding to 17.7% of total loans disbursed by the banking industry and doubtful loans reached about 57% of total NPLs.

Compared to other European countries, Italy is characterized not only by the size of the phenomenon but also by the strong weight of NPLs originated from credits granted to companies, compared to those originating from loans to households.

The primary challenge connected to such clogged banks' balance sheets, as a result of the increasing NPLs, lies in the difficult to dispose of streams needed for the provision of loans to customers.

The Bank of Italy's data indicate that gross doubtful loans have increased consistently since the crisis began in 2007, from 40 billion Euro to 197 billion Euro, from about 2.3% of total loans to over 10% in July 2015 (Bank of Italy, 2015, pp. 1-47).

As to doubtful loans at break-up value, net of depreciations, there is a lower growth due to the higher depreciations provisions made by Italian banks. The percentage increased from eight per cent in late 2008 to 4.5 percent in July 2015. According to the latest data, 80% of doubtful loans originated from loans granted to companies, especially non financial companies (Lossani et al., 2015, pp. 1-93).

NPLs increased for non-financial companies, from 26.7 to 131 billion euro. The rate of new doubtful loans — that is the ratio of the value of new loans and the stock of loans at the beginning of the period — has risen significantly for all types of customers after the outbreak of the crisis and returned to fall only in 2014, but remaining at historically high levels.

NPLs growth rates have rapidly and strongly increased for non financial companies, because of the crisis, non financial companies have become the most risky customer for banks, overcoming households. The peak was reached in 2013 for non financial companies with 4.6 euro of new doubtful loans for every 100 euro of new loans (for households the maximum was reached the following year, reaching a value of 3.6% (Bank of Italy, 2015, pp. 1-47).

Consequently, this resulted a strong increase in the annual flow of NPLs that banks have had to endure in their balance sheets. Between 1999 and 2007, the amount of NPLs generated by the banking industry in a single year was maintained between 9 and 13.5 billion euro. From 2009, it was permanently over 28 billion euro, reaching a peak of 43 billion in 2013.

High stocks of NPLs can penalize the provision of loans by the banking industry, constraining the supply of credit to customers.

Recent data collected by the International Monetary Fund (2015) for a large group of European banks confirm that banks with a larger amount of NPLs are less profitable, they have buffer weaker capital and higher funding costs. Furthermore, these banks tend to reduce lending, with major effects on those customers most dependent on bank credit, such as small and medium companies.

First of all, a high level of doubtful loans reduces profits because banks require higher depreciations that reduce the balance sheet margins.

Secondly, unlike loans NPLs do not generate income, while the greater riskiness of assets of the banks' balance sheet requires a more expensive access to capital for the banks.

Furthermore, the lower profitability raises the risk perception by investors, with a further negative impact on the banks' funding capacity.

If a large amount of NPLs was handed off by banks, it would generate a significant impact on credit supply;

and Italy would be a major beneficiary of this effect.

Literature has examined the relationships between bank loan quality and financial and macroeconomic variables. In particular, it is oriented toward two lines of investigation: a first line analyzes the influence of macroeconomic determinants on bank credit (Gambera, 2000, pp. 6-9; Kelirai & Scheicher, 2002, pp. 58-74; Hoggarth et al., 2005, pp. 1-44; Babouček & Jančar, 2005, pp. 14-22; Marcucci & Quagliariello, 2008, pp. 46-63; Bofondi & Ropele, 2011, pp. 14-17); a second line considers jointly the incidence of economic-financial and macroeconomic components on bank credit (Pittaluga & Morelli, 1998, pp. 40-42; Salas & Saurina, 2002, pp. 203-224; Hess et al., 2009, pp. 331-343; D'Amico & Biscotti, 2013, pp. 28-39).

The work aims to investigate the incidence of banks' size and financial variables on the ratio of impaired loans to gross loans and also on the ratio of doubtful loans to total asset. It also aims to investigate the impact of macroeconomic indicators on bank loan quality.

The analysis is conducted on a sample composed of 60 Italian banks, divided into 20 joint stock banks, 20 cooperative banks and 20 popular banks, evenly distributed all over the country.

The analysis method is based on multivariate panel regressions models, and the study was carried out for the years 2008-2014.

The empirical analysis shows that the ratio of impaired loans to gross loans and the ratio of doubtful loans to total asset are negatively related to return on average assets and to banks' size. Therefore, these two variables exert a positive influence on loan quality.

Regarding the macroeconomic determinants, results point out that there is a positive relationship between the unemployment rate and both dependent variables. So, the unemployment rate exerts a negative influence on loan quality.

The paper is structured as follows: section 2 is about the review of literature on the topic, it deals with the contributions focused on the incidence of macroeconomic determinants on bank credit quality and non-performing loans (2.1), and studies focused on the incidence of both economic-financial variables and macroeconomic variables on credit quality in banks (2.2). Section 3 shows the empirical analysis in terms of methodology (3.1), sample (3.2) and main findings (3.3). Last section summarizes brief conclusions.

## **2. Literature Review and Research Hypotheses**

### **2.1 Macroeconomic Determinants of Bank Loan Quality**

The connection between macroeconomic conditions and bank credit is underlined by empirical evidences, showing that favorable macroeconomic conditions such as sustained economic growth, low unemployment and low interest rates, tend to be associated with a better quality of bank loans.

Kalirai and Schleicher (2002, pp. 58-74) have investigated the relation between a set of macroeconomic variables and loan loss provisions, taking into account Austrian banks over the period 1990-2001. The results demonstrate that the loan quality is influenced by short-term interest rates, industrial production, and the return of the stock markets.

Hoggarth et al. (2005, pp. 1-44) have developed a model to examine the dynamics between the write-off ratio of British commercial banks and some macroeconomic variables, using quarterly data in the period 1988-2004. The authors have found a significant and positive relationship among the bank's write-off ratio, retail prices inflation and the nominal interest rates.

Babouček and Jančar (2005, pp. 14-22) have estimated the impact of a set of macroeconomic variables describing the development of the Czech economy and the functioning of its bank lending channel in the period 1993-2006, applied to monthly data. The results of their study show a significant and positive relationship among the non-performing loans, the unemployment rate and consumer prices inflation. Several contributions highlight that the macroeconomic determinants may have a different impact on loan quality, depending on the reference industry, or on the type of customer.

Among the most recent studies Gambera (2000, pp. 6-9) analyzed the effect of macroeconomic variables on loan quality in the United States over the period 1987-1999, taking into account the following sectors: agriculture, commercial, industrial and residential. The explanatory variables of the bank assets quality turn out to be the unemployment rate and incomes in the agricultural sector and in other sectors.

Quagliariello's contribution (2007, pp. 119-138) focused on the riskiness of Italian bank credit over the period 1985-2002. The analysis demonstrates that loan losses provisions and non-performing loans follow a cyclical pattern as they decrease generally during periods of economic growth and increase during downturns. This leads to a contraction in profits and loans in bad times, especially in banks with lower capitalization.

Marcucci and Quagliariello (2008, pp. 46-63) have investigated the trend of default rates in the Italian banking system during the period 1990-2004. The authors have found that the default rates follow a cyclical pattern, in particular they are low in periods of growth and they increase in downturns. This evidence is robust for households loans, for firms and for the non-financial sector.

More recent studies have been carried out by Bofondi and Ropele (2011, pp. 14-17) and have been related to loan quality over the 1990-2010 period. The main results of their studies prove that the loan quality could be explained by macroeconomic variables such as general state of the economy, the cost of borrowing and the burden of debt for the households and firms. The results related to firms point out a positive relationship among bad loans, the unemployment rate and the ratio of net interest expenses to gross operating profits; results also highlight a negative relationship between the bad loans and the consumption of durable increases.

## **2.2 Micro and Macroeconomic Determinants of Bank Loan Quality**

A very important line of literature considers jointly the incidence of microeconomic bank level variables and macroeconomic variables on bank credit quality.

In particular, the Italian contribution by Pittaluga and Morelli (1998, pp. 40-42) analyzes the causes of the strong growth of bad loans that took place in Italy during the nineties, trying to verify if the increased riskiness of the loans was attributable to the behavior of the banks, and especially to the customer selection criteria, or to factors related to the worsening of the real economy. According to the authors, the increase in bad loans in Italy was inevitably due to a downturns of the economy since the estimates did not indicate a change due to the banks behavior in the screening activities.

Salas and Saurina (2002, pp. 203-224) have studied the effect of the determinants of bank problem loan on a sample of Spanish commercial banks and savings banks in the period 1985-1997. In particular, their study is focused on the incidence that economic and financial indicators (indebtedness, banks' size, the capital ratio, the net interest margin, the portfolio composition and the bank branches expansion) and macro variables (the GDP growth rate) have on the ratio between non-performing loans and total loans. The results of their study are similar for both categories of banks with regard to macroeconomic variables, while as regards to the specific variables of the banks the results are partly different. Economic and financial variables have higher explanatory power for saving banks compared to commercial banks. The authors have found: a statistically significant relationship

among bank problem loan and growth policies, net interesting margin, managerial inefficiency, and loan portfolio composition for the saving banks; a significant and negative relationship between bank problem loan and banks' size and total capital ratio for commercial banks.

The analysis conducted by Hess et al. (2009, pp. 331-343) has the aim of verifying the relationship between financial variables of banks and macroeconomic variables and the ratio of credits losses to total loans, observing 22 Australian and 10 New Zealand banks in the period 1980-2005. There have been similar results for both countries. With regard to macroeconomic variables, the results show a significant relationship between the credits losses and the expansion rate; while concerning the economic-financial variables of banks, a significant relationship occurs between the credits losses and return share index. Furthermore, the results point out that smaller banks with a high net interest margin have lower credits losses.

In a recent study D'Amico and Biscotti (2013, pp. 28-39) have investigated the influence of financial variables (profitability measured by Roaa, total amount of loans, the growth rate of loans, banks' size and number of bank branches) on non-performing loans of the cooperative banks in a specific Italian territorial area over the time period 1995-2009. The analysis found positive and significant relationship between non-performing loans and the banks' size and the number of bank branches. Subsequently, the study was elaborated with an additional analysis that relates non-performing loans with financial, governance and macroeconomic indicators. The results demonstrated a positive and significant relationship among non-performing loans, loan growth rate and number of bank branches. Moreover, the evidences showed negative and significant relationships between the level of non-performing loans and the banks' size and the Roaa.

The main studies on the issue come to the conclusion that bank credit quality is affected by both the specific financial variables of the bank and by the macroeconomic fluctuations.

Therefore, in light of the analyzed literature, it is interesting to investigate the existence of significant relationships between credit quality and profitability and efficiency ratios in Italian banks and also the existence of significant relationships between credit quality and banks' size.

The study also investigates the existence of significant relationships between credit quality and macroeconomic determinants, such as unemployment and inflation rates.

During the long crisis that has been affecting European economy, the amount of NPLs has reached a value of about 20% of the gross domestic product in Italy, a level much higher than other European countries. So, Italy is one of those countries where the phenomenon of NPLs has grown faster and for this reason it may be very interesting to study the impact of macroeconomic determinants on credit quality in crisis years, in Italy.

In order to achieve this aim, the following research hypotheses have been formulated:

Hp1: there is a statistically significant relationship between credit quality of banks and financial variables related to profitability, efficiency and banks' size;

Hp2: there is a statistically significant relationship between credit quality of banks and macroeconomic determinants such as unemployment and inflation rates;

Hp3: there is a statistically significant relationship between non-performing loans and financial variables related to profitability, efficiency and the banks' size;

Hp4: there is a statistically significant relationship between non-performing loans and macroeconomic determinants such as unemployment and inflation rates.

### 3. Empirical Analysis

#### 3.1 Methodology

In order to test the research hypotheses, the analysis has been carried out through multivariate regressions panel models over the period 2008-2014.

In the first model, the dependent variable is represented by credit quality (*Credet*), i.e., the ratio of impaired loans to gross loans, in order to verify the first two research hypotheses; while in the second model, the dependent variable indicates the non-performing loans (*Doubtful*), i.e. the ratio of doubtful loans to total asset, in order to verify the third and fourth research hypotheses.

The models are set out below as follow:

$$\text{Credet}_{it} = \beta_0 + \beta_1 \text{Roaa}_{1it} + \beta_2 \text{CI}_{1it} + \beta_3 \text{Lsize}_{1it} + \beta_4 \text{Inf}_{1it} + \beta_5 \text{Une}_{1it} + \beta_6 \text{L\_lotb}_{1it} + \beta_7 \text{Tcr}_{1it} + \varepsilon_i$$

$$\text{Doubtful}_{it} = \beta_0 + \beta_1 \text{Roaa}_{1it} + \beta_2 \text{CI}_{1it} + \beta_3 \text{Lsize}_{1it} + \beta_4 \text{Inf}_{1it} + \beta_5 \text{Une}_{1it} + \beta_6 \text{L\_lotb}_{1it} + \beta_7 \text{Tcr}_{1it} + \varepsilon_i$$

The *Pooled OLS models* are supported by the results of collinearity tests and heteroskedasticity tests (White test), and in order to improve the quality of the analysis it has been conducted an analysis with *robust standard errors*. Moreover, a further analysis *panel with fixed effects* was carried out, as confirmed by the Hausman test, in order to improve the goodness and consistency of the estimates.

In view of making more rigorous analysis and gather the heterogeneity on the temporal component, it has been considered appropriate to insert the time dummy variables.

The independent variables considered in the analysis refer to the previous year compared to the dependent variables. The lag periods applied only to the analyzed independent variables may allow to reduce the potential endogeneity problems.

The *dependent variables* considered are:

*Credet<sub>i</sub>*: indicates the quality of bank loans and is calculated as the ratio of impaired loans to gross loans; data collected from the database Bankscope;

*Dbtf<sub>it</sub>*: indicates non-performing loans, calculated as the ratio of doubtful loans to total asset; data collected from the database Bankscope.

The independent variables include both economic-financial indicators and macroeconomic variables. The economic and financial indicators are as follows:

*Roaa<sub>i</sub>*: *Return on Average Assets*, expresses the efficiency with which the bank uses its assets to generate income, and it is calculated as the ratio between net income and the average value of total assets in the financial year; data collected from the database Bankscope;

*CI<sub>it</sub>*: *Cost income*, is calculated as the ratio of operational costs on earnings margin; data collected from the database Bankscope;

*Lsize<sub>it</sub>*: *Banks' size* measured by the natural logarithm of total assets; data collected from the database Bankscope.

The Macroeconomic indicators are as follows:

*Inf<sub>it</sub>*: *Inflation*, indicates the increase in the overall average level of prices of goods and services over a given time-period, generating a decrease in the purchasing power of money; data collected from the Eurostat;

*Une<sub>it</sub>*: *Unemployment*, is the statistical indicator of the labor market, it measures the discrepancy due to an excess of labor supply compared to the labor demand. It is calculated as the ratio of jobseekers to the labor force; data collected from the Eurostat.

Finally, the control variables examined are:

$Lotb_{it}$ : *Loans and Advances to Banks*, measured by the natural logarithm of the loans to banks; data collected from the database Bankscope.

$Tcr_{it}$ : *Total capital ratio*, indicates the capital adequacy ratio according to Basel rules; data collected from the database Bankscope.

### 3.2 Sample

The analysis has been conducted on a sample composed of 60 Italian banks, divided into 20 joint stock banks, 20 cooperative banks and 20 popular banks, evenly distributed throughout the country.

They are considered over the period 2008-2014.

For the sample construction were collected data relating to:

- specific financial variables of the bank from the database “Bankscope”;
- macroeconomic variables from the website “Eurostat”.

The main descriptive statistics of the variables studied in the period 2008-2014 are reported in the Table 1 (minimum, maximum, average and standard deviation).

**Table 1 Descriptive Statistics (2008-2014)**

|          | Min    | Max     | Mean   | Std.dev |
|----------|--------|---------|--------|---------|
| Credet   | 1.220  | 36.070  | 11.055 | 6.077   |
| Doubtful | 0.001  | 0.248   | 0.046  | 0.034   |
| Roaa     | -5.880 | 2.760   | 0.223  | 0.740   |
| CI       | 14.930 | 133.330 | 69.359 | 13.739  |
| Size*    | 113    | 438298  | 20988  | 72932   |
| Infl     | 0.000  | 3.500   | 2.016  | 1.315   |
| Une      | 5.400  | 12.100  | 8.500  | 2.287   |
| Lotb*    | 2      | 202097  | 3964   | 20795   |
| Tcr      | 7.450  | 59.020  | 17.678 | 7.446   |

Note: \*Values expressed in thousands of Euros.

### 3.3 Main Results of the Analysis

The analysis has been conducted by multivariate regressions panel model. The *Pooled OLS models* were supported by the results of collinearity and heteroskedasticity tests. The collinearity test has allowed to exclude problems of collinearity among the variables.

The White test allows to detect the presence of heteroskedasticity and determines the analysis with robust standard errors.

The table 3 shows in detail the regression coefficients and test statistics, derived from the analysis *panel with fixed effects*, considering the *Credet* dependent variable. The results in the table 3 highlight the goodness of the model, revealing a high adjusted R square (0.842) which indicates that the analyzed variables explain 84% of the variance of the dependent.

With particular reference to the specific financial variables, there is a significant and negative relationship between credit quality (*Credet*) and variables related to the *cost income (CI<sub>I</sub>)*, the size and profitability of the bank (*Roaa<sub>I</sub>*).

The results referring to the banks' size show a negative relationship with the dependent variable, so a bigger dimension is associated with a reduction of the impaired loans to gross loans ratio (*Credet*) and it improves loan

quality.

The relationship between credit quality and *Roaa* is also negative and shows that banks with greater return on assets are characterized by a lower incidence of impaired loans that is a higher credit quality.

Regarding the cost income — a ratio used in the management efficiency analysis of the banks — results point out a negative relationship with the dependent variable. Indeed, as decreasing this index value/balance sheet ratios, the cost containment policies are most efficient, but results show that this may be associated to a greater incidence of impaired loans.

Considering results related to macroeconomic independent variables, it is possible to observe a statistically significant and positive relationship between the unemployment rate (*Une\_1*) and the *Credet* dependent variable, highlighting that an increase in the unemployment level has a negative impact on credit quality.

Therefore, it is possible to argue that the first and second research hypotheses are verified for the *Credet* variable.

**Table 2 Pooled OLS Models-Regression-Credet (2008-2014)**

|                | <i>Coeff.</i> |     | <i>T Statistic</i>   | <i>p-value</i> |
|----------------|---------------|-----|----------------------|----------------|
| Const.         | 14.9788       | *** | 5.2297               | 0.00001        |
| Roaa_1         | -5.0939       | *** | -8.8388              | 0.00001        |
| CI_1           | -0.1173       | *** | -5.4804              | 0.00001        |
| Lsize_1        | -0.5734       |     | -1.5995              | 0.11061        |
| Infl_1         | 0.3121        | *** | 2.9484               | 0.00341        |
| Une_1          | 0.9314        | *** | 10.1340              | 0.00001        |
| L_lotb_1       | -0.1625       |     | -0.6312              | 0.52833        |
| Tcr_1          | 0.0906        | **  | 2.0729               | 0.03891        |
| R <sup>2</sup> | 0.5741        |     | R <sup>2</sup> adj.  | 0.5656         |
| F(7,352)       | 67.79739      |     | P-value (F)          | 0.000          |
| White          | 52.0018       |     | P-value ( $\chi^2$ ) | 0.0321         |

Note: Level of Significance \*10%; \*\*5%; \*\*\*1%.

**Table 3 Panel Fixed Effects Dummy Variables-Credet (2008-2014)**

|                             | <i>Coeff.</i> |     | <i>T Statistic</i>   | <i>p-value</i> |
|-----------------------------|---------------|-----|----------------------|----------------|
| Const.                      | 24.4250       | *   | 1.8212               | 0.06960        |
| Roaa_1                      | -2.2977       | *** | -5.4790              | 0.00001        |
| CI_1                        | -0.0499       | **  | -2.3368              | 0.02013        |
| Lsize_1                     | -3.5537       | *   | -1.8481              | 0.06561        |
| Infl_1                      | 0.0352        |     | 0.2352               | 0.81424        |
| Une_1                       | 1.8682        | *** | 7.7368               | 0.00001        |
| L_lotb_1                    | 0.6087        | *   | 1.8252               | 0.06900        |
| Tcr_1                       | -0.0397       |     | -0.4588              | 0.64673        |
| dt_2                        | -0.8875       | **  | -2.1534              | 0.03212        |
| dt_3                        | -1.0467       | *** | -3.3099              | 0.00105        |
| dt_4                        | 6.4124        | *** | 6.1143               | 0.00001        |
| R <sup>2</sup>              | 0.8725        |     | R <sup>2</sup> adj.  | 0.8422         |
| F(69,290)                   | 28.77329      |     | P-value (F)          | 0.000          |
| Hausman                     | 36.4625       |     | P-value ( $\chi^2$ ) | 0.000          |
| Number of observations      | 360           |     |                      |                |
| Number of group             | 60            |     |                      |                |
| Observations for each group | 6             |     |                      |                |

Note: Level of Significance \*10%; \*\*5%; \*\*\*1%.



**Determinants of Impaired Loans and Doubtful Loans in Italy**

With regard to non-performing loans (*Doubtful*), the results of the *Panel Fixed Effects*, in Table 5, illustrate a good adjusted R square (0.762) and a significant p-value.

Considering the specific financial variables of the bank, a significant and negative relationship between the ratio of doubtful loans to total asset (*Doubtful*) and the profitability of the bank (*Roaa\_1*) may be observed. Also according to the second model, a better return on asset may be associated to a better loan quality.

At the same time, banks' size (*Lsize\_1*) has a significant and negative relationship with the dependent variable, showing — in line with the results of the first model - that the increase of the banks' size can be associated with a better loan quality.

Finally, in relation to the macroeconomic determinants, only for the unemployment rate (*Une\_1*) is possible to remark a significant and positive relationship with doubtful loans, pointing out that an increase in the unemployment rate may lead to an increase in the non-performing loans.

Therefore, also the third and fourth research hypotheses are verified.

**Table 4 Pooled OLS Models-Regression-Doubtful (2008-2014)**

|                | <i>Coeff.</i> |     | <i>T Statistic</i>   | <i>p-value</i> |
|----------------|---------------|-----|----------------------|----------------|
| Const.         | 0.0629        | *** | 2.9723               | 0.00316        |
| Roaa_1         | -0.0277       | *** | -4.6977              | 0.00001        |
| CI_1           | -0.0006       | *** | -4.2568              | 0.00003        |
| Lsize_1        | 0.0018        |     | 0.6344               | 0.52620        |
| Infl_1         | 0.0009        |     | 1.4037               | 0.16130        |
| Une_1          | 0.0030        | *** | 5.5795               | 0.00001        |
| L_lotb_1       | 0.0043        | **  | -2.1617              | 0.03131        |
| Tcr_1          | 0.0004        |     | 1.5678               | 0.11784        |
| R <sup>2</sup> | 0.4522        |     | R <sup>2</sup> adj.  | 0.4413         |
| F(7,352)       | 41.5183       |     | P-value (F)          | 0.000          |
| White          | 151.5047      |     | P-value ( $\chi^2$ ) | 0.000          |

Note: Level of Significance \*10%; \*\*5%; \*\*\*1%.

**Table 5 Panel Fixed Effects Dummy Variables-Doubtful (2008-2014)**

|                             | <i>Coeff.</i> |     | <i>T Statistic</i>   | <i>p-value</i> |
|-----------------------------|---------------|-----|----------------------|----------------|
| Const.                      | 0.2306        | **  | 2.0162               | 0.04470        |
| Roaa_1                      | -0.0099       | *** | -2.9732              | 0.00319        |
| CI_1                        | -0.0001       |     | -0.8327              | 0.40571        |
| Lsize_1                     | -0.0288       | *   | -1.8161              | 0.07039        |
| Infl_1                      | 0.0002        |     | 0.2267               | 0.82078        |
| Une_1                       | 0.0088        | *** | 4.8245               | 0.00001        |
| L_lotb_1                    | -0.0008       |     | -0.3882              | 0.69816        |
| Tcr_1                       | -0.0009       |     | -1.3797              | 0.16873        |
| dt_2                        | -0.0021       |     | -0.6969              | 0.48642        |
| dt_3                        | -0.0019       |     | -1.0588              | 0.29057        |
| dt_4                        | 0.02985       | *** | 3.7523               | 0.00021        |
| R <sup>2</sup>              | 0.8077        |     | R <sup>2</sup> adj.  | 0.7620         |
| F(69,290)                   | 17.66096      |     | P-value (F)          | 0.000          |
| Hausman                     | 23.2466       |     | P-value ( $\chi^2$ ) | 0.00148        |
| Number of observations      | 360           |     |                      |                |
| Number of group             | 60            |     |                      |                |
| Observations for each group | 6             |     |                      |                |

Note: Level of Significance \*10%; \*\*5%; \*\*\*1%.

#### 4. Conclusion

As a result of the financial crisis, after 2007, the level of non-performing loans has been worsening and enhancing significantly.

During the long crisis that has been affecting European economy, in Italy the amount of NPLs has reached a value of about 20% of the gross domestic product and this percentage has been much higher than European average.

The paper focuses on this important issue and aims to investigate the determinants of bank problem loans considering banks' specific variables and macroeconomic indicators.

Therefore, an analysis has been conducted on the incidence that specific variables of banking institutions and macroeconomic variables have on the loan quality, that is the level of impaired loans and the level of non-performing loans in bank's balance sheets.

Four research hypotheses are formulated: the first hypothesis refers to the existence of a statistically significant relationship among the level of impaired loans and profitability of credit institutions, the cost income and the banks' size; the second hypothesis refers to the possible existence of a statistically significant relationship between the level of impaired loans and macroeconomic determinants such as unemployment and inflation rates; the third research hypothesis refers to the existence of a statistically significant relationship among the level of doubtful loans and profitability of credit institutions, the cost income and the banks' size; the last refers to the existence of a statistically significant relationship between the level of doubtful loans and macroeconomic determinants, such as unemployment and inflation rates.

With reference to macroeconomic determinants, findings highlight that there is a positive relationship between the unemployment rate and both dependent variables. Therefore, the unemployment rate has a negative influence on loan quality. These results are in line with part of the examined literature (Babouček & Jančar, 2005, pp. 14-22; Bofondi & Ropele, 2011, pp. 14-17).

With reference to bank level data, the empirical analysis points out that both the ratio of impaired loans to gross loans and the ratio of doubtful loans to total assets are negatively related to return on average assets and to banks' size (Salas & Saurina, 2002, pp. 203-224; D'Amico & Biscotti, 2013, pp. 28-39).

The results can influence the management policies in bank lending, since a reduction in the return on average assets can be considered an early warning indicator for future bank problem loans.

The more interesting result is related to the relationship between credit quality ratios and bank's size. According to the result obtained, larger banks may have less problem loans.

This result may have implications for bank supervisory policy. The issue of the bank's size-particularly the size of banks operating in the cooperative credit system-is hotly debated in the Italian banking system, affected by a recent reform of popular banks and an upcoming reform of cooperative banks; so the results achieved may have implications on the dynamic management of bank loans.

Therefore, understanding the causes of problem loans may help anticipate the possibility of bank distress. This work try to contribute to the literature on the issue and shows that credit quality may be associated to microeconomic individual bank level variables.

The present work is a preliminary version and it may be improved. The future perspectives of this work will lead to broaden both the sample and the period of observation.

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