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CREDIT RISK DETERMINANTS IN THE VULNERABLE ECONOMIES OF EUROPE: EVIDENCE FROM THE ITALIAN BANKING SYSTEM

Abstract:

This study uses the ARDL approach to cointegration to identify the factors affecting credit risk in the Italian banking system over the period 1997Q4–2017Q1. The ratio of new bad loans to the outstanding amount of performing loans in the previous period is the selected proxy of credit risk whereas a wide range of explanatory variables are included in the study. Compared to the previous studies, a wider timeframe is investigated, which captures the booming period, the global financial crisis and the ongoing Eurozone sovereign debt crisis. The findings suggest that macroeconomic cyclical, bank-specific, and financial market variables affect the flow of new bad loans in the Italian banking system. The high significance of the sovereign debt crisis risk proxy signals the important link between banking and sovereign debt crisis.

Keywords:

Credit risk, macroeconomic determinants, bank-specific variables, sovereign debt crisis, Italian banking system, credit risk, Italian banking system, sovereign debt crisis

JEL Classification: C32, G17, G21

Introduction

Financial disturbances and the fast pace through which they are spread among regions, have always called the attention of economists. The 2008 global financial crisis (GFC hereafter) unfolded the fragility of bank intermediation with the deterioration in the quality of banks' loan portfolio being at the centre of episodes that marked the recession (Nkusu, 2011). Given this, identifying those factors that influence credit risk (typically measured by non-performing loans or loan loss provisions), has been at the centre of the relevant literature over the last years.

Europe is among the regions that have mostly attracted academics' attention on the issue as it was hit stunningly fast by the GFC and since 2010 is swimming in its own Eurozone debt crisis. Italy is among the first six countries that established the EU and its economy is the third largest in the area. The recent consecutive recessions though, along with the high unemployment and extreme levels of public debt have labeled it as a peripheral economy of Europe. As such, due to the increased defaults on customer loans, also the Italian banks are suffering huge losses since the beginning of the GFC.

Based on the above, the purpose of this study is to investigate the determinants of credit risk in the Italian banking system. By employing the ARDL approach to cointegration over the period 1997Q4-2017Q1, the key objective is to explain the ratio of new bad loans to the stock of performing loans at the end of the previous quarter, through a wide range of variables. It is worth noting that, the flow of new bad loans is considered a more precise indicator of banks' portfolio riskiness compared to the bad debts' stock which can simply decrease with some loans' write-off (Quagliariello, 2004).

This study adds to the existing literature since up to date, similar studies performed for Italy have used other estimation techniques and no other investigation has covered such an extended timeframe. Moreover, new variables are introduced for the first time in the investigation, which result statistically significant to credit risk. Empirical findings from this study generate useful insights and offer recommendations for bank managers and policymakers in the country.

The paper is organized as follows: The next session discusses the academic literature on the credit risk determinants whereas Section 3 provides a brief overview of the Italian economic and banking sector developments. Section 4 describes the dataset and the methodology employed for empirical investigation whereas Section 5 discusses the empirical findings. The paper concludes with Section 6.

1 Literature review

This section aims to provide a brief critical review of the main theoretical and empirical work performed on the determinants of credit risk. Theoretical contributions rely on two main environments that may influence credit risk: the macroeconomic and the banking-sector environment.

According to Demirguc-Kunt and Detragiache (1997), a weak macroeconomic environment characterized by slow GDP growth and high inflation as well as banks' low liquidity and a high share of credit to the private sector, causes banking crises. Other macroeconomic variables that may affect credit risk are: the unemployment rate, interest rate and the exchange rate. The first two are expected to accelerate loans' defaults whereas the effect of the exchange rate can be positive or negative depending on the debt's currency. A currency appreciation may directly affect the debt servicing capacity of individuals by making local products more expensive. On the other hand, foreign currency loans are aided by the local currency appreciations which make them cheaper for the borrowers (Mishkin, 1996; Nkusu, 2011). Such effect is more significant in those countries with the highest percentage of foreign currency loans (e.x. South Eastern Europe). Despite bank's liquidity and credit growth, the leverage ratio is also considered a significant contributor to credit risk. The moral hazard hypothesis indicates that banks with low capital tend to be riskier by undertaking excessive lending, thus, face higher loan losses (Gavin and Haussmann, 1996; Berger and DeYoung, 1997).

As it will be unfolded below, the relevant empirical literature applies various methodologies on a variety of macroeconomic and bank-specific variables which are considered potential influencers of credit risk. To proxy the latter, typically, studies use the non-performing loans (NPLs hereafter) or the loan loss provisions ratio. It is worth noting that such studies are mostly performed in a cross-country context with some of them including also Italy in their panel.

Castro (2013) employs dynamic panel data approaches to the GIPSI countries and concludes that GDP growth, unemployment rate, interest rates, share price indices, credit growth and the real exchange rate are crucial in determining credit risk over the 1997Q1-2011Q3 period. Anastasiou et al (2016) study uses the GMM and quarterly data of euro-area banks for the 1990–2015 period, to conclude that economic growth, unemployment and bank specific variables such as management skills and risk preferences matter to NPLs. Moreover, tax on personal income and the output gap are distinguished as significant explanatory variables. Makri et al (2014) investigate 14 countries of the Eurozone (including Italy) over the pre-crisis period 2000-2008. They find strong correlations between NPLs and various macroeconomic (public debt, unemployment, GDP growth) and bank-specific (capital adequacy ratio and return on equity) variables. Similar results are achieved by Mesai and Jouini (2013) for Greece, Italy, and Spain for

the period: 2004-2008. They conclude that GDP growth and the profitability of banks' assets are positively related to credit quality in the investigated countries whereas the inverse relationship exists with the unemployment rate, the loan loss reserves to total loans and the real interest rate. In line with these findings, the study by Blanco and Gimeno (2012) for a panel of 50 provinces concludes that unemployment, credit growth and the interest debt burden matter to loan default rates in Spain.

Louzis et al (2012) argue that despite the common macroeconomic variables, public debt is significant to credit risk of the Greek banks. Among the bank-specific variables, only managerial efficiency has a significant negative impact. Ali and Daly (2010) also confirm the relevance of the macroeconomic environment to credit risk when Australia and the U.S. are investigated. GDP growth and the short term-interest rates are crucial to NPLs although not in the same scale in each country. Similarly, Pesola (2005) finds that income and real interest rate shocks may trigger financial instability in several industrial countries. On the other hand, Kakvler and Festic (2012) argue that when large current account deficits are caused by structural dependence on external financing, the vulnerability of the financial system increases as is the case of the Romanian and Bulgarian banking systems over the 1997-2008 period.

VAR models are among the main methods used by the literature to examine the effect of a limited number of explanatory variables (usually up to five) on credit risk and vice versa. Considering that usually bank crisis are associated by credit tightening and less funding sources for firms' projects, it is believed that they may trigger economic downturn (Marcucci and Qualiagriello, 2008). Therefore, a variety of studies are also focused on investigating this feedback effect.

Berger and DeYoung (1997) study the causal relationship between loan quality, cost efficiency and bank capital. They found a negative feedback relationship between cost efficiency and problematic loans and that capital reduction in low capitalized banks causes problematic loans. Similarly, Diamond and Rajan (2005) suggest that liquidity and solvency problems interact and can cause each other. According to Gambera (2000), the unemployment rate, farming income, housing permit, state annual product and bankruptcy filings cause bad loan on a sample of US banks. Foglia's (2008) study introduces market based indicators such as equity prices and corporate bond spreads which are found to be strong influencers of defaulting loans. Nkusu (2011) concludes that slow GDP growth and unemployment positively affected credit risk in a large group of advanced economies from 1998 to 2009. Besides, his findings suggest that a sharp increase in NPLs triggers long-lived tailwinds that disable macroeconomic performance from several fronts. By applying the VAR approach, Klein (2013) finds that the level of NPLs in Central, Eastern and South-Eastern Europe (CESEE) is influenced by GDP growth, unemployment and inflation as well as from the profitability, level of equity and

excessive risk taking of the banks. Moreover, a feedback relationship between NPLs and macroeconomic downturns is noted, meaning that countries that face loan crisis are condemned to economic recessions. Monokroussos et al (2016) study concludes in a negative bi-directional causality between GDP growth and NPLs and employment and NPLs in Greece over the period 2005-2015.

Other studies apply cointegration techniques such as the Engle-Granger approach and the Autoregressive Distributed Lag approach to cointegration (ARDL), to determine the short-term and long-term relationship between the selected independent variables and the NPLs. Yurdakul (2014) applies the Engle-Granger approach to investigate Turkey, for the period 1998-2012. Findings suggest that GDP growth and the Istanbul Stock Exchange index reduce credit risk in the long run, whereas money supply, the foreign exchange rate, unemployment, the inflation rate and the interest rate have the adverse effect. Similar results are also achieved by Delgado and Saurina (2004).

The ARDL approach to cointegration is relatively new in the credit risk determinants literature and therefore studies applying it are limited in number. Greenidge and Grosvenor (2009) employ the ARDL approach to investigate NPLs in Barbados over the period 1996-2008 and conclude that they are significantly affected by interest rates in the long run while Nikolaidou and Vogiazas (2013) following the same approach conclude that the lending growth jointly with money supply and unemployment have a significant long-run impact on Romania's credit risk over the period 2001-2010. Consistently, Nikolaidou and Vogiazas (2014) find that NPLs in the Bulgarian banking system are explained by both macroeconomic and industry-specific variables as well as by exogenous factors such as the recent global financial crisis. Gila-Gourgoura and Nikolaidou (2016), conclude that the real GDP, the Spanish long-term government bond yield, the return on equity, the total credit granted by the Spanish banks and their capital to assets ratio, explain credit risk in Spain both in the short and the long run.

As far as Italy is concerned, Quagliariello (2004) investigates the procyclical nature of banks' behavior for a large panel of Italian banks over the period 1985-2002. By estimating both static and dynamic models, findings suggest that loan loss provisions and the flow of new bad debts increase in bad macroeconomic times. This study is extended by Marcucci and Quagliariello (2008), when the VAR methodology is employed to test whether the feedback effect from bad loans to economic performance applies, over the period 1990-2004. In line with the previous study, a significant first round effect¹ is found confirming that the default rates follow a cyclical pattern. However, no strong evidence of a feedback effect between the two was found. Findings seem to suggest that, when capital surpluses over regulatory minimum are low, banks may reduce lending, which, in

¹ Output gap, inflation rate, 3 month interbank interest rate and real exchange rate cause bad loans.

turn, negatively affects the output levels. Bofondi and Ropele (2011) are also focused on the flow of new bad loans in the Italian banking sector over the period 1990Q1-2010Q2. The authors use a single-equation time series approach to separately explain the households and firms bad loans through a variety of macroeconomic variables. They conclude that among the chosen influencers, general economic conditions, the cost of borrowing and the burden of debt significantly affect the quality of both kinds of loans. The latter worsens particularly in the years following the financial crisis, due to the increased unemployment rate.

In contrast to previous studies, Anastasiou (2017) employ fixed and random effects and a dynamic GMM estimation to conclude to a weak impact of business cycle on the quality of loans in Italy, more precisely, such effect is significant only in the dynamic level. Moreover, it is found that credit cycle is highly significant to bad loans since the relaxation of terms related to credit growth will in turn worsen the quality of the loans granted. Such result is also confirmed by the Granger causality test.

To summarize, the abovementioned studies, agree on the sensitivity of credit quality to macroeconomic, bank-related environment and financial markets. The methodologies used and the explanatory variables considered, vary among studies. The proposed study for Italy is a step forward compared to the previous ones since it includes the sovereign debt crisis in its timeframe, a fact which is particularly significant when investigating a country with the second highest indebtedness in Europe. Moreover, it uses the ARDL approach to cointegration, which as it will be explained later, has certain advantages to the ones already applied in the literature.

2 Economic and Financial Background

Unlike other Southern European countries, Italy is known for its historical economic stability. The process of convergence towards the economic standards of the most advanced European countries quickened during World War I and successfully continued in the following years (Colli, 2014). With a capitalistic economy relying upon a diversified manufacturing sector that is export oriented and highly specialized, Italy became the country of industrial leaders. Business, agriculture and luxury automobile are the key sectors along with textiles, fashion and tourism.

Nowadays, Italy is the 8th largest economy in the world and the 3rd in the Eurozone. Still, it is characterized as a peripheral country of Europe along with Greece, Ireland, Portugal and Spain. Despite the steady growth shown over the years, Italy's economy slowed down in the end of year 2007, in parallel with the deterioration in the world economic condition. According to the Bank of Italy (2011) Economic Outlook report, Italy was hit hard by the crisis as a consequence of its large public debt, dependence on world trade, and poor medium-term growth prospects. Indeed, Italy is the second country in Europe

(after Greece) with the highest public debt to GDP ratio which reached 133% in the year 2016 compared to an average of 83% ratio of the European Union whereas the unemployment rate has reached 11% with 40% of the youth unemployed. A weak recovery in 2010 was interrupted by the sovereign debt crisis, which triggered a second recession starting in the third quarter of 2011 (Bonaccorsi di Patti et al, 2015).

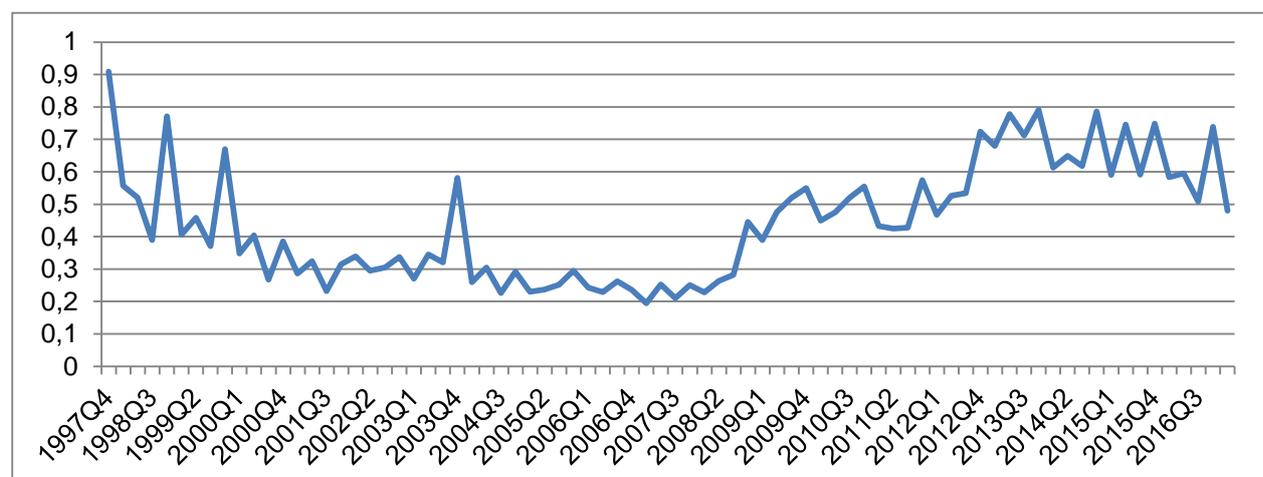
According to the recent BI (2017) Economic Bulletin, Italy's economy has finally entered a moderate growth driven mainly by the revival of investment and the expansion of household expenditure. Employment is rising but there is still ample underutilization of labor. The country's public debt remains the biggest concern despite the Government's declaration that the 2017 debt to GDP ratio is expected to decline by 0.4% compared to that of year 2016. As a result, risk premiums on Italian Government securities still remain high.

As far as Italy's banking system is concerned, the cyclical movements in the economy affected also the stability of the Italian banks and above all had a negative impact on the lending quality (Albertazzi et al, 2013). Prior to the global financial crisis, the Italian banking system was swimming in an expansionary cycle characterized by rapid growth in bank lending and an increased competition and efficiency among banks. Several reforms undertaken during the 1990s (e.g. the privatization of banks previously under public control) and the fall of spreads due to Euro creation, brought bank activity to a new level with extreme lending accounting for 55% of the GDP in the year 2007 compared to 40% in 2000.

As observed in Figure 1, the rate of new bad loans¹ during this period remained low, between 0.2 and 0.3%. The unfold of the crisis though, associated with macroeconomic disturbances in the country, led to a considerable contraction in bank lending and an increased number of new bad loans, a situation that still has not improved and remains the biggest threat to the profitability of Italian banks. More precisely, the newly defaulting loans ratio increased, from 0.3% to 0.5% during the first phase of the financial crisis and ranged from 0.5% and 0.8% in the years coinciding with the European sovereign debt crisis (2011Q3 and on). The value of this ratio on the last quarter of the year 2016 was among the highest achieved, some 0.73%.

¹ The formal classification of problematic loans adopted by Italian banks includes four categories: (i) Past due/overdrawn more than 90 days, (ii) substandard loans, (iii) restructured exposures and (iv) bad loans. The category of bad loans includes exposures to insolvent counterparties (even if not legally ascertained), regardless of any loss estimate made by the bank and irrespective of any possible collateral or guarantee. (Schiantarelli et al, 2016).

Figure 1: Ratio of new bad debts to outstanding loans (quarterly flow of adjusted bad debts in relation to the stock of loans at the end of the previous quarter %); 1997Q4-2017Q1.



Source: Bank of Italy

According to the BI (2017) stability report, the improved macro-economic conditions in the country have had positive effects on the stability of the Italian banking system. Lending to households and non-financial private sector has entered a moderate growth. Capital strengthening measures for the banks are undertaken with the help of Government intervention. The acceleration of economic growth, the liquidation of two banks in June and the increase in the non-performing loans' sales transactions during 2017 have lowered the non-performing loans ratio for Italy.

Still, the flow of new bad loans as a ratio to total loans remains high, implying that the factors affecting the quality of loans in the Italian banking system are still active. As noted in the BI (2017) Stability Report, despite signs of improvement, Italy's banks are still exposed to significant risks such as the weakening of the economic recovery and the great uncertainty of the investors about the global and in particular the European markets.

3 Data and methodology

3.1. Data

The discussion of the empirical literature unfolds the main variables that are commonly believed to affect credit risk whereas the brief overview of the economic and financial conditions of Italy provides clues on the factors that may particularly relate to our empirical investigation. Taking stock from both, this study uses quarterly data for a wide range of explanatory variables¹ and a selected proxy of credit risk for the Italian banking

¹ A summary of the explanatory variables considered in this study is outlined in Table 1 of the Appendix

system. Specifically, to measure the latter, this paper has chosen the ratio of new bad loans to the stock of performing loans at the end of the previous quarter (NBLR). A timeframe of almost 20 years will be investigated, with quarterly observations that span from the last quarter of the year 1997 to the first quarter of the year 2017. The novelty of this paper lies in the fact that along with the good times also two important time spans are included in the investigation: the first recession coinciding with the global financial crisis and the second one related to the Eurozone debt crisis.

The macroeconomic variables selected in this study are: the unemployment rate, the consumer price index, the trade balance, the current account, the gross external debt, the industrial production index, the public debt, the construction activity index, the real GDP (and its components) and the monetary aggregates (M1, M2 and M3). All variables are expected to be positively related to credit quality in Italy, with the exception of the unemployment rate and the public debt which comprise the most problematic features of the Italian economy over the last decade. As commonly agreed in the relevant literature, high unemployment is associated to a decreased potential of debt repayment and therefore to a bigger stock of bad loans. Such effect is expected to be strong in Italy, considering the existing labor crisis. On the other hand, public debt with its sky-high levels has become an obstacle for the Italian economy to overpass the continuous recessions. Albertazzi et al (2013), argue that all trouble for Italy initiated in the public sector and then it was transferred to the banking system. Thus, it is believed that a high public debt has a negative effect on the quality of loans.

An increased debt burden will make it difficult for borrowers to honor their debts and therefore the loans' quality will fall. To measure such effect for Italy, the long term Government bond and the 3-month Euribor are introduced in this study whereas the difference between the two (the slope of the yield curve) is used to determine whether the outlook for economic growth impacts bad loans. The oil price and the index of the Italian stock market (FTSEMIB) are two indicators of financial markets that are expected to negatively impact bad loans. On the other hand, the S&P 500 Chicago Board Options Exchange Market Volatility Index (VIX) has gained acceptance as an indicator of global uncertainty or financial stress and as such is considered also in this study. It is expected to have a positive effect on bad loans.

Considering the relevance of the European sovereign debt crisis to Italy, the spread between the yield on the 10-year Italian government bond and the corresponding German one (the BTP-Bund spread) is considered an important indicator of the sovereign debt risk in this study and is expected to positively affect the Italian bad loans. Indeed, Albertazzi et al (2013) argue that it is impossible to avoid a transmission of the ongoing tensions in the sovereign debt market to the banking system, due to the high level of public debt and the heavy exposure of Italian banks to domestic sovereign bonds.

The bank-specific variables considered in the study include: credit growth, the capital to assets ratio, loans to deposits ratio, loans to assets ratio, the interest rate on loans to households, the interest rate on loans to non-financial corporations and the interest rate on deposits. The overall credit growth is among the widely used indicators since its high levels usually indicate that more risky loans are approved thus, its effect on bad loans is expected to be positive. In the case of Italy, such positive relation is expected to be particularly strong considering the unrestricted bank lending prior to the crisis. The loans to deposits ratio measures the portion of deposits which is utilized in loans by the bank, thus, is an important indicator of the latter's liquidity as well as risk undertaking. Consistently, a low capital to assets ratio indicates excessive risk-taking. However, as supported also by the relevant literature, its effect on bad loans may be either positive or negative since adequately capitalized banks may as well engage in high-risk activities. Both interest rates on loans to customers are expected to be negatively associated to the loans' quality whereas the opposite effect is expected for the interest on deposits.

3.2. Methodology

This study has chosen the ARDL bounds approach to identify the existence of a long-run relationship between NBLR and the set of macroeconomic, bank-related and country-specific indicators. In contrast to other cointegration techniques, the ARDL approach to cointegration can be applied irrespective of the order $I(0)$ or $I(1)$ of the variables' integration and corrects for residual serial correlation and the problem of endogenous variables (Shahbaz and Islam, 2011) therefore, the first step of the empirical work is to verify that no variable included in the dataset is of order $I(2)$, using the ADF and Philip Perron (1988) tests but also the test that allows for an endogenous determination of a break, namely Perron (1997).

Despite being relatively new in the credit risk determinants literature, the ARDL approach to cointegration was firstly introduced by Pesaran and Smith (1998) and Pesaran and Shin (1999) and holds other advantages as well over typical cointegration techniques. Specifically, the ARDL approach allows using a sufficient number of lags which is optimal on the basis of standard criterion such as Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC) (Mallick and Agarwal, 2007). Specifically in our study, a maximum order of 4 lags is selected based on quarterly observations usage whereas the Schwarz Bayesian Criterion determines the optimal lag length of each variable.

Furthermore, the error correction version of the ARDL equation determines both the short and the long-run relationship between the variables in the model since it uses both the variables' differences and the lagged long-run solution. Based on the above, the following equation is proposed to explain credit risk:

$$\text{NPL} = f(\text{NPL}_{-t}, \text{Macro}, \text{Banking}, \text{Other}) \quad (1)$$

Where NPL is the ratio of non-performing (doubtful) loans to total loans, NPL_{-t} is the lagged value of NPL, Macro stands for the macroeconomic cyclical indicators explained above, Banking stands for the banking industry-specific indicators explained above, Other comprises interest rates or others factors which as explained above are considered relevant in determining credit risk in Italy.

4 Empirical findings

Prior to estimating the ARDL approach, it is tested whether all variables included in the dataset are $I(0)$ or $I(1)$. Apparently, the real GDP contains 2 unit roots and therefore is excluded from the model. The Perron unit root test confirms the existence of a structural break in the third quarter of the year 2008 which coincides with the initiation of the global financial crisis. Therefore a dummy is created that takes the value 1 from 2008Q3 and on. Considering the usage of quarterly data, a maximum number of 4 lags is selected in our study, whereas the Schwarz Bayesian Criterion determines the optimal lag length of each variable. Specifically, the ARDL(4,1,2,1,0) specification is selected from the criterion.

The estimates of the ARDL regression are outlined in Tables 1 and 2 along with the respective diagnostic tests. Table 2 in the Appendix provides the key regression statistics. Based on the results, the quality of loans in the Italian banking system is affected by the sovereign risk spread (SPREAD), the unemployment rate (UNE), the capital to assets ratio (CAP), credit volume (LCREDIT) and the market volatility index (VIX). As observed in Table 2, such effect is significant in the long-term at the 10%, 5% and 1% level of significance and bears the expected sign. The dummy variable was not significant and as such was dropped from the model. However, it may be assumed that the crisis's effect is captured by VIX, the indicator of financial distress in the market.

Table 1. The long-run ARDL regression

Regressor	Coefficient	t-ratio
SPREAD	0,03221	1,8062
CAP	-7,468	-2,2634
UNE	0,0879	6,446
LCREDIT	0,4405	3,3045
VIX	0,00597	2,6492
C	-6,2507	-3,4842

The sovereign risk spread has a positive effect on the new bad loans ratio implying that conflicts in the sovereign debt market are also transmitted to Italian banks, affecting particularly the quality of their loans. These findings are in line with the study of Albertazzi et al (2011) whose results suggest that higher sovereign spreads are associated to a

reduction in bank productivity. The unemployment rate has the expected positive effect on bad loans. Bofondi and Ropele (2011) also concluded that the ratio of new bad loans increases with the unemployment rate. In contrast, a high capital to assets ratio decreases new bad loans. Highly capitalized banks seem to have a low level of new bad loans in the Italian banking system considering that they are engaged in less risky activities. Credit expansion is associated with more neglected and less restricted loan granting processes and therefore has a positive effect on the new bad loans ratio. Anastasiou (2017) also found that credit cycle is crucial to bad loans in Italy. The market volatility index has a significant positive effect on the long-run implying that potential fear in the market causes an increase in bad loans.

The error correction model of the ARDL regression outlined in Table 2, confirms that all the above mentioned variables determine credit risk also in the short- run except for the market volatility index (VIX). As observed, the error correction coefficient (Ecm) is highly significant and bears the correct sign.

Table 2. The ECM of the ARDL regression

Regressor	Coefficient	t-ratio
dNBLR1	-0,3266	-2,2622
dNBLR2	-0,1202	-0,9216
dNBLR3	-0,3095	-3,1697
dSPREAD	0,0195	1,9475
dCAP	2,6927	0,9061
dCAP1	6,9450	2,4526
dUNE	0,0320	2,4173
dUNE1	-0,0540	-4,5406
dLCREDIT	0,2660	4,6116
dVIX	-0,7495	-0,6121
Ecm(-1)	-3,7880	-4,7158
R ² =0,826; F(11,62)= 25,62		

Diagnostic Tests

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ(4)= 5.4654[.243]	F(4, 55)= 1.0965[.367]
B: Heteroscedasticity	CHSQ(1)= 0.43977[.834]	F(1, 72)= 0.4281[.837]

To summarize, it may be concluded that high unemployment, a common sign of economic recession, has a negative impact on the quality of loans in the Italian banking system. On the other hand, a sound regulation of the banking system that promotes adequate capital reserves for banks and sufficient supervision on lending practices, improves the quality of Italian loans.

Lastly, financial distress in the global markets and the tensions in the sovereign debt market seem to be directly transmitted to the Italian banking system. More precisely, the flow of new bad loans increases, which translates to a more fragile banking system and can trigger further banking crisis. The effect of the sovereign debt risk is highly significant both in the short and in the long run implying that as long as the high indebtedness of the country remains an unsolved puzzle, the stability of the Italian banking system is at risk.

5 Conclusions

This paper investigated the deterministic factors of credit risk in the Italian banking system over the period 1997Q4-2017Q1, by employing the ARDL approach to cointegration. Italy is a particularly interesting case in this regard considering that new bad loans continue to build up, despite the attempts to get rid of the existing stocks either by selling or writing them off. Besides, Italy's high involvement in the European sovereign debt crisis and the continuous economic recessions over the last decade, have created the proper environment for another financial crisis to burst.

Taking stock from the relevant empirical literature and the economic and financial background of Italy, a wide range of variables from the macroeconomic, the banking-industry environment and financial markets are considered in the study as to capture any potential effect that the latter may have on credit risk. Compared to other similar investigations performed for Italy, this study is the first that employs the ARDL approach to cointegration which appears to be an appropriate one in terms of the different levels of integration of variables. Moreover, variables that account for the financial distress in the global markets and the risk of the actual sovereign debt crisis are introduced for the first time to explain credit risk in Italy.

The findings suggest that Italian bad loans are significantly affected by the unemployment rate, the total credit granted by the Spanish banks, the capital to assets ratio, VIX and the sovereign debt crisis risk both in the short and the long run. The accurate monitoring of these significant contributors to credit risk, becomes a must in order to avoid further financial distress in the already weakened Italian banking system. Considering the sizeable weight of the Italian economy in the European one, challenges for policymaking exceed the borders of a single country and become crucial to the whole stability of the European Union.

APPENDIX**Table 1.**

Indicators		
NBLR	New bad loans/Total performing loans on the previous	Bank of Italy
CPI	Consumer Price Index annual rate (%)	IMF
UNE	Unemployment rate (%)	IMF
CA	Current Account	Bank of Italy
GED	Gross External Debt	Bank of Italy
IPI	Industrial Production Index	Bank of Italy
PD	Public Debt	Bank of Italy
CON	Construction Index	Bank of Italy
GDP	GDP at constant terms	Bank of Italy
GFCF	Gross fixed capital formation at constant terms	Bank of Italy
TCONS	Total consumption at constant prices	Bank of Italy
M1		Bank of Italy
M2		Bank of Italy
M3		Bank of Italy
FTSEMIB	Italian Stock Market Index	Bank of Italy
OIL	Brent crude oil price fob in Euro per barrel	Bank of Italy
VIX	The CBOE Volatility Index	CBOE
LTGB	Long term government bond rate	CBOE
EURI3M	Euribor 3-month rate	CBOE
YIELD	The yield curve slope	Authors' calculations
SPREAD	The sovereign debt risk	Authors' calculations
CRE	Gross loans granted by the Spanish banks	Bank of Italy
CAP	Capital to assets ratio	Bank of Italy
LDEP	Loans to deposits ratio	Bank of Italy
LASS	Loans to assets ratio	Bank of Italy
CINT	Interest rate on loans granted to households	Bank of Italy
CINT	Interest rate on loans granted to non-financial	Bank of Italy
DEPINT	Interest rate on deposits	Bank of Italy

Table 2. ARDL (4,0,2,1,2,1) selected based on Schwarz Bayesian Criterion

Regressor	Coefficient	t-ratio
NBLR(-1)	0.067	0.65
NBLR(-2)	0.206	2.13
NBLR(-3)	-0.189	-1.82
NBLR(-4)	0.309	3.16
SPREAD	0.019	1.94
CAP	2.692	0.90
CAP(-1)	-0.273	-0.28
CAP(-2)	-6.945	-2.48
UNE	0.032	2.41
UNE(-1)	0.033	2.25
UNE(-2)	0.054	4.54
LCREDIT	0.026	4.61
VIX	0.043	-0.61
VIX(-1)	0.552	3.58
C	-3.788	-4.71
R ² =0.9041; F(14,59)= 39.69		

*All variables are significant at 10%, 5% and 1% significance level.

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