Credit Risk Determinants in European Banking: Evidence from Albania, Italy, Spain and Turkey (1998-2016)

By

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Abstract

Credit risk has always been a major risk in banking given that financial crises are usually associated by an increase on loan defaults. The 2008 global financial crisis revealed the fragility of banking systems and highlighted the importance of identifying the determinants of credit risk, in order to prevent banking systems from collapse and as such to maintain the stability of the whole financial system. In the aftermath of the 2008 crash, Europe was faced with another crisis, namely, the Eurozone debt crisis that considerably affected several developed countries especially those that are characterized as peripheral European countries. In parallel with the increased risk of default on their debts, these countries also faced tremendous problems in their banking sectors as the quality of loans granted by their banks further deteriorated, enhancing the argument that credit risk is an issue of core interest to financial stability. Moreover, the high dominance of some peripheral countries' banks in the banking sectors of less developed European economies (i.e. Albania) suggests that specific events in these countries might have a spillover effect.

Based on quarterly data over the period 1998-2016, this thesis provides empirical evidence on the link between credit risk and a range of explanatory variables for four European countries, namely, Albania, Italy, Spain and Turkey. Motivated by the weak economic conditions and the increased bank credit risk in Italy and Spain in the aftermath of the sovereign debt crisis as well as by the significant presence of Italian and Spanish banks in the banking systems of Albania and Turkey respectively, the contribution of the thesis is fourfold: First, a thorough credit risk investigation is provided for each focal country, based on unique features, exclusively related to them (such as the Italian and the Spanish debt crisis spreads that proxy the sovereign debt crisis risks in Italy and Spain respectively). Secondly, a spillover effect of the sovereign debt crisis in Albania and Turkey is investigated since it is believed that shocks may be easily transmitted through bank and trade channels even to economies that are not directly exposed to the crisis. To the author's knowledge, this is the first time that such a spillover effect is investigated in the relevant literature. Thirdly, a wider timeframe is investigated, compared to that analyzed in the previous studies, which captures the booming period (1998-2007), the global financial crisis (2008-2009) and the ensuing European sovereign debt crisis (2010-2012) where Italy and Spain were deeply involved as well as the aftermath of the two crises (2013-2016). Lastly, the empirical research is based on the ARDL approach to cointegration, which is rarely applied in the existing literature on credit risk and holds certain advantages against other econometric techniques. Besides, the methodological approach is complemented by robustness checks through the use of other approaches such as the VECM framework and the impulse response analysis.

Findings suggest that macroeconomic, bank-specific, and financial markets' variables affect credit risk in the Albanian, Italian, Spanish and Turkish banking systems. The positive effects of the Italian and the Spanish sovereign debts on credit risk uncover the important link that exists between banking and the sovereign debt crisis. Moreover, findings suggest a contagious effect of the Italian debt crisis in Albania, given that the Italian debt crisis spread has a significantly positive effect on the Albanian credit risk. A similar spillover effect (of the Spanish debt crisis spread) in the Turkish credit risk does not appear to be significant, indicating that in contrast to Albania, the Turkish banking system is more domestically oriented.

The findings' diversity among the focal countries emphasizes the role of country-specific features in determining credit risk and the importance of country case - studies to credit risk modeling; individualized results can be thoroughly interpreted by policy makers in each country, and thus, may be effectively used to regulate accordingly.

Declaration

I declare that this thesis is my own work, except where acknowledged in the text. I further declare that this thesis has not been submitted for a degree at any other university.

Dedication

To my parents, Brahim and Tatjana Gila

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List of Abbreviations

ADF	Augmented Dickey Fuller
ARDL	Autoregressive Distributed Lag
AIC	Akaike Information Criteria
BBVA	Banco Bilbao Vizcaya Argentaria
BKT	Banka Kombetare Tregtare
BIS	Bank of International Settlements
BIST	Borsa Istanbul
BRSA	Banking Regulation and Supervision Agency
CBOE	Chicago Board Options Exchange
CBRT	Central Bank of the Republic of Turkey
CEE	Central and East European
CESEE	Central East and South East Europe
CPI	Consumer Price Index
ECB	European Central Bank
ECM	Error Correction Model
ECT	Error Correction Term
EEC	European Economic Community
EU	European Union
FSI	Financial Soundness Indicators
FDI	Foreign Direct Investment
FSIs	Financial Soundness Indicators
FTSEMIB	Financial Times Stock Exchange Milano Indice di Borsa
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GIPSI	Greece, Italy, Portugal, Spain and Ireland
GMM	Generalized Method of Moments
IMF	International Monetary Fund
ISPA	Intesa Sanpaolo Bank
LLPs	Loss Loan Provisions
MG	Mean group
NPLs	Non-performing loans
PMG	Pooled Mean group
PP	Philip and Perron
REER	Real Effective Exchange rate
ROA	Return on Assets

ROE	Return on Equity
SBC	Schwarz Bayesian Criteria
SEE	South East Europe
VAR	Vector autoregression
VECM	Vector Error Correction Model
VIX	CBOE Volatility Index
WTO	World Trade Organization

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

"The most important risk that banks are exposed to is credit risk, which involves loans that are not paid back"

Yurdakul (2014, p.1)

Prior to the 2008 global financial crisis (GFC hereafter), banks in most countries were reporting a stable quality of their loans (Beck et al., 2013). However, banking systems have been through various ups and downs during their long history of development mainly due to unsustainable macroeconomic policies (i.e. large current account deficits and high public debt), excessive lending, international trade imbalances and lack of government regulation (Laeven and Valencia, 2012; Cornad and Gimet, 2012). The decreased quality of loans portfolio though, usually captured by non-performing loans (NPLs), has been the common feature of banks' sufferance in most cases (Demirguc-Kunt, 1989; Gonzales-Hermosillo et al, 1997; Nkusu, 2011). For example, as Gonzalles-Hermosillo et al (1997) claim, NPLs ratio in Mexico jumped to 10%[1] after the peso collapse in December 1994 while during the early 1990s, the severe banking crisis in the industrialized Nordic countries (Finland, Norway and Sweden) was associated with a drastic accumulation of loan losses which in the case of the Finish banks, far exceeded their regulatory capital as at the end of 1990 (Pesola, 2001). Since then, research interest on credit risk modeling increased substantially. The fact that banks were not experiencing a run on customers' deposits but rather a deterioration in the quality of their loans, shifted regulators' attention from the liabilities side of banks' balance sheet to the assets' side.

Besides, the design of the new international bank capital accords, known as Basel II and Basel III, required banks to define their capital requirements according to the internally measured risk of each credit exposure instead of being simply based on the credit type, as specified in Basel I (Bonfim 2009; Ali and Daly 2010). Considering that banks had to seriously deal with the proper amount of capital to hold in their balance sheets in order not to increase their default risk or not to decrease their efficiency, an accurate measurement of the factors that contribute to credit risk became crucial.

Investigating the determinants of credit risk received even more attention in the relevant literature, in the aftermath of the GFC, given that (similarly to the previously mentioned financial crises) the latter was not associated with a run on deposits but with deterioration in loans' quality

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[1] According to the authors, the reported ratio is surely underestimated considering that the System of Statistical Information of Mexico, generally excludes data for banks after they have received financial support.

(Schiantarelli et al., 2016). Specifically, massive mortgage delinquencies were registered in the U.S. in 2008, followed by the collapse of Lehman Brothers and a range of bailout plans undertaken by the Government to avoid other major financial institutions' failure. Such turbulence was soon transmitted to other countries due to the tight interconnectedness of financial institutions all over the world and thus, the crisis became global (Fong and Wong, 2012). Among the sources of the financial systems' weaknesses surfaced by the GFC, the worsened quality of bank credit was at the centre of episodes that marked the recent recession (Nkusu, 2011; Beck et al., 2013, Castro, 2013). Indeed, Chaibi and Ftiti (2015) claim: *"It seems that a banking crisis is primarily caused by banks' incapacity to satisfy their payment obligations, a situation that is essentially triggered by impaired loans on their balance sheet"* (Chaibi and Ftiti, 2015, p.2). And as Fofack (2005) argues, the soundness of banking systems may only be achieved through an accurate estimation of credit risk drivers. Therefore, identifying those factors that affect credit risk exceeds any other attempt to examine the vulnerability of banking systems (Sorge, 2004; Castro, 2013).

In the aftermath of the GFC, many European banks experienced huge losses. Some were rescued by the respective governments through capital injections[2] while some others were nationalized (Gerhardt and Vander Vennet, 2017). The crisis affected all the large banking systems, however, the impact varied among countries because of different starting cyclical conditions and structural vulnerabilities (BIS, 2018). Sizeable imbalances emerged even within the European Union (EU) countries since most policy instruments remained at the national level (Baselga-Pascual et al., 2015). While banks in Sweden fared quite well and did not need government capital support, many banks in the Eurozone incurred large losses in the crisis aftermath (BIS, 2018). More precisely, the Eurozone countries in the Mediterranean region (Greece, Italy, Portugal and Spain) were particularly hit by the GFC and a successive crisis, namely, the European debt crisis (2010-2012) and they still constitute the Achilles heel of the Eurozone financial and economic stability, regarding flaws in the banking system (i.e. high default rates on loans), high unemployment and extreme levels of public and private sector debt. Diverse post-crisis outcomes were also observed among the emerging European economies (non-EU members)[3]; those with the largest pre-crisis economic imbalances were hit the most (i.e. Southeast European countries such as Albania) (Cihak and Mitra, 2009). On the other hand, banks in emerging economies that had already undergone previous crises (i.e. Turkey) were less affected from the GFC given their domestic focus, low use of market funding and relatively high resilience to shocks as a result of lessons learnt from previous domestic crises (BIS, 2018).

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[2] Not less than 114 European banks benefited from government support during the period 2007-2013 (Gerhardt and Vander Vennet, 2017).

[3] All the 19 countries that form the Eurozone are considered high-income countries according to the World Bank (2019) classification.

To this extent, the GFC revealed the heterogeneity among the European countries regarding their economic policies and the ability of their financial systems to overcome stress; distinctive divergences exist not only among the developing countries that are not part of the EU but also within the Eurozone, which seems to comprise a heterogeneous group of economies operating in the same market. Given this, identifying those factors that impact the vulnerability of European banking systems, reflected in an increased number of NPLs, requires a thorough separate analysis for each country.

Surprisingly, there is very limited empirical work in the relevant literature for individual European countries. This is particularly the case for Albania and Turkey (non-EU countries) and to a lesser extent for Italy and Spain (Eurozone members). Specifically, Albania and Turkey are under-researched and the existing studies that try to explain credit risk in these countries are incomplete since they investigate short time intervals, based on a limited number of data and non-advanced econometric techniques. Moreover, most of the limited studies are cross-country analyses that provide generalized findings on the determinants of credit risk in the developing economies. Italy and Spain on the other hand, are largely involved in numerous cross-country surveys and less in country-specific studies. Moreover, the existing individual analyses for both countries do not capture the effect of the recent developments in Europe (debt crisis) despite the fact that Italy and Spain have been deeply involved in the turmoil.

Given the lack of country-case studies, the heterogeneity among European countries and the recent European debt crisis, this thesis aims to empirically investigate the macroeconomic, banking-industry and country-specific factors that affect credit risk over the period 1998Q1-2016Q1[4], by focusing on four European countries, namely, Albania, Italy, Spain and Turkey. The selected timeline covers the big economic and financial boom (1998-2007), the burst of the global financial crisis (2008-2009), the European sovereign debt crisis (2010-2012) which is particularly relevant to two of the focal countries, specifically, Italy and Spain and the post-crises period up to the beginning of the year 2016. The chosen countries constitute interesting case studies given their unique economic and banking features regarding credit risk.

Specifically, Italy and Spain are core EU countries that joined the EU[5] in 1958 and 1986 respectively, whose recent unfavorable economic and financial conditions have characterized them as peripheral EU countries within the same group named GIPSI countries (along with Greece,

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[4] With the exception of Albania, for which data is available only since 1998Q4.

[5] The EU originates from two European Communities: the European Coal and Steel Community (ECSC) and the European Economic Community (EEC), established, respectively, by the 1951 Treaty of Paris and 1957 Treaty of Rome. The first members of these Communities were: Belgium, France, Italy, Luxembourg, the Netherlands and West Germany. However, later on other countries were added to the list, including Spain. In the year 1993, the EU was established by the Maastricht Treaty and as of today is comprised of 28 countries.

Ireland and Portugal). Although Greece was on the spot in the aftermath of the GFC[6], growth contraction, increased unemployment and decreased creditworthiness have become common features of Italy and Spain (Castro, 2013). Both countries are two of the main protagonists of the debt crisis (along with the other GIPSI countries): Italy's public debt was 135% of GDP in the end of October 2019, representing the 2nd largest public debt among Eurozone countries and the 4th largest worldwide, whereas the Spanish public debt ratio reached 95% of GDP (IMF, 2019b). In parallel with the worsened economic conditions, Italian and Spanish banks are dealing with excessive credit risk and it seems that the consecutive shocks apparently have considerably weakened their position. A decade following the GFC onset, their banking systems are still dealing with extreme levels of NPLs (Anastasiou et al., 2016).

Despite the numerous similarities though, each country has its own history of economic and financial progress, marked by idiosyncratic features. For instance, it is worth noting that, Italy's public debt was already high prior to the eruption of the GFC[7] and the European debt crisis whereas Spain's public debt started to increase at the burst of the GFC. Thus, the economic and financial turbulences in Italy over the last decade are not mostly related to the banking system leverage but rather to the public sector indebtedness and the sizeable exposure of Italian banks to domestic sovereign bonds that makes them sensitive to tensions in the sovereign market (Albertazzi et al., 2013). Italian banks suffered little during the first phase of the GFC unlike other European countries (such as Spain) given that problems in Italy started in the public sector and were later transmitted to the banking system (Albertazzi et al., 2013). In contrast, Spain witnessed an extreme demand for housing on the decade preceding the GFC that accelerated the excessive leverage by banks (Ramos-Francia et al., 2014). Therefore, the growing imbalances that led to a rapid increase in the public debt of Spain in the aftermath of the GFC can be attributed to the indebtedness of the private sector. In this respect, it becomes obvious that the Italian and Spanish banking systems' resiliencies are quite different, despite the fact that they have been operating for years under the same roof of the Euro Area regulations.

On the other hand, Albania and Turkey are non-EU countries that are in the process of joining the Union (candidate countries). Albania is a Southeast European country, whose open economy emerged thirty years ago, after almost half a century of extreme communism and isolation from the rest of the world. Given this, Albania became a magnet for foreign direct investment (FDI) flows particularly in its banking system, which is mainly foreign-owned. Albania's economy appears to

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[6] Greece was at the edge of a default on its sovereign debt in 2010, an event that seriously threatened the stability of the Eurozone and almost led to another global financial crisis. To avoid these, Greece was granted consecutive loans from the EU until 2018 and undertook harsh austerity measures in order to be able to make repayments. Its sovereign debt remains still sky-high, comprising 180% of its GDP as of end of year 2018.

[7] According to the IMF, Italy's public debt ratio was 102% of GDP in the end of year 2008 whereas Spain's public debt ratio was half of the Italian one, more precisely, 53% of GDP.

be closely related to Italy's economy given that the latter is the destination of over half of Albania's exports and the main hosting country (along with Greece) of Albanian immigrants at the fall of the communist regime in the year 1991 (Bank of Albania, 2016). As the GFC hit, economic slowdown followed, accompanied by a dramatic increase in NPLs ratio that still remains the main concern of the Albanian banks (Bank of Albania, 2017).

Turkey is a transcontinental country, mostly located in Western Asia, with a small portion in the Southeast Europe and therefore is considered a crucial intermediary between West and the Middle East. The Turkish economy experienced rapid growth since 2002 and Turkey was categorized an upper-middle-income country (World Bank, 2020). Recently, the significant Turkish lira depreciation and the political turbulence in the country have provided a suitable environment for growing economic and financial vulnerabilities (World Bank, 2020). Still, it is worth mentioning that in contrast to the economies of Albania, Italy and Spain, Turkey's economy recovered quickly from the GFC as evidenced by high growth, low unemployment rate and modest public debt in the aftermath of the GFC. Moreover, its banking system proved to be quite resilient to shocks considering that it managed to maintain a low level of NPLs (Central Bank of the Republic of Turkey, 2015). Turkish banks were not strongly affected by the GFC like their peers in advanced and other emerging market economies, owing to the banking sector reforms undertaken in the wake of the Turkish financial crisis of 2001[8] (Ganioglu and Us, 2014). Specifically, structural reforms and drastic improvements in the regulatory framework of the Turkish banking system were implemented, after the 2001 crisis (Macovei, 2009).

Hence, the rationale of selecting Albania, Italy, Spain and Turkey as focal countries is threefold. Firstly, they are found at different stages of economic and financial development; according to the World Bank classification, Italy and Spain are classified as high-income countries whereas Albania and Turkey belong to the group of upper middle-income countries. As it was previously highlighted though, divergence persists even between countries that fit the same income category. Therefore, it becomes an important policy issue to identify the specific factors that determine credit risk in each of these countries' banking systems since idiosyncratic accelerators may exist despite the fact that problems may appear similar.

The second reason for selecting the focal countries is related to the European sovereign debt crisis. The latter strengthened regional diversity in bank outcomes since for many of them the high-indebtedness represented an additional adverse shock that worsened their low post-crisis performance (BIS, 2018). Although the crisis directly concerns the high indebtedness of certain European countries, it is believed to also affect the stability of their banking system due to the

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[8] At the beginning of the year 2001, Turkey faced one of the most severe crises in its history: growth decreased by 6%, public debt doubled to 74% of the GDP whereas NPLs ratio reached to 18% (Ozatay and Sak, 2002).

banks' large sovereign exposure (Acharya et al., 2018). Therefore, Italy and Spain represent interesting case studies for investigating credit risk determinants, considering their connection to the European sovereign debt crisis. Moreover, the significant foreign capital presence in the Albanian banking system and in particular the fact that Greek and Italian banks share 24% of the market (Bank of Albania, 2018), make place for discussion whether the sovereign debt shock is transmitted also to Albanian banks through the foreign-owned subsidiaries. On the other hand, the presence of foreign banks (subsidiaries and foreign bank branches) in the Turkish banking system has expanded considerably over the last decade; as of 2017, less than half of the banks operating in Turkey were foreign, some of which with European capital (Ersoy and Cagil, 2017). Given this, including Turkey in the investigation will provide further insights on the contagious effect of the sovereign debt crisis through bank channels.

Thirdly, identifying credit risk determinants in the banking systems of the focal countries is a matter of major importance given that the Albanian, the Italian and the Spanish banking systems are still reporting abnormal levels of NPLs although a decade has passed since the crisis' outbreak whereas the loans' quality in Turkey is threatened at the dawn of another crisis in the country, fueled by the Lira depreciation, despite the fact that loans granted by the Turkish banks have exhibited a quite satisfactory performance since 2003. Moreover, the expanded presence of European banks in the Turkish banking system over the recent years and more importantly, the fact that they have granted loans to Turkish firms, may be the reasons for these banks to encounter losses on their loans' portfolios as Euro becomes more expensive to Turkish borrowers. Therefore, it seems that identifying the determinants of credit risk in the Turkish banking system is of great importance not only to the financial stability of Turkey which is now threatened by the brewing of another crisis in the country but also to that of Europe.

Given the above, the main objectives of this thesis are:

- To detect the macro, banking-industry and country-specific determinants of credit risk of four focal countries, namely, Albania, Italy, Spain and Turkey that are characterized by various similarities but also specific differences. Given their interesting/unique features (see earlier discussion), analyzing each country separately will aid their bank managers and regulators on efficiently dealing with credit risk.

- To contribute to the existing relevant literature by providing empirical evidence on the under researched developing countries of Europe (Albania and Turkey) and provide updated estimations that consider both the GFC and the European debt crises impact for the vulnerable developed countries (Italy and Spain) that are still struggling with elevated NPLs.

In order to meet the above objectives, the thesis attempts to answer the following research questions:

- Which are the determinants of credit risk in Albania, Italy, Spain and Turkey?
- Does the European sovereign debt crisis matter to the vulnerability of the financial systems of the countries suffering it (Italy and Spain) or to the vulnerability of those connected to them through economic ties and bank channels (Albania and Turkey)?
- How do findings differ among countries that are found at different stages of economic and financial development and how important are country-specific features on this matter?

To answer these questions, the empirical research uses a quarterly dataset over the period 1998-2016 that consists of macroeconomic, financial markets, banking system specific and country – specific variables as independent variables that are selected based on the relevant empirical literature suggestions and on the specificities of each country. Credit risk is measured by the NPLs ratio in all the countries except for Italy, in which case due to data constraints, the ratio of the flow of new bad loans to total loans is used as credit risk indicator. It is worth noting that, such measure is considered a more precise indicator of banks' portfolio riskiness in Italy compared to the NPLs stock, which can simply decrease with some loans' write-off (Quagliariello, 2004).

The research applies the autoregressive distributed lag (ARDL) approach to cointegration developed by Pesaran and Smith (1998), Pesaran and Shin (1999) and Pesaran *et al.* (2001), which holds several advantages compared to other econometric techniques commonly used in the literature. No previous study devoted to the credit risk determinants focusing on these countries has used the ARDL approach to cointegration. Furthermore, to check the robustness of the results, the maximum likelihood procedures introduced by Johansen (1988) and Johansen and Juselius (1990), such as the VECM model is also employed and the impulse response functions are estimated.

The thesis contribution is fourfold: First, a thorough credit risk investigation is provided for each focal country, based on unique features, exclusively related to them (such as the Italian and the Spanish debt crisis spreads that proxy the sovereign debt crisis risks in Italy and Spain respectively). Second, a spillover effect of the sovereign debt crisis in Albania and Turkey is investigated since it is believed that shocks may be easily transmitted through bank and trade channels even to economies that are not directly exposed to the crisis. To the author's knowledge, this is the first time that such a spillover effect is investigated in the relevant literature. Third, a wider timeframe is investigated, compared to that analyzed in the previous studies, which captures the booming period (1998-2007), the global financial crisis (2008-2009) and the ensuing European sovereign debt crisis (2010-2012) where Italy and Spain were deeply involved as well as the aftermath of the two crises (2013-2016). Lastly, the empirical research is based on the ARDL approach to cointegration, which

is rarely applied in the existing literature on credit risk and holds certain advantages against other econometric techniques. Besides, the methodological approach is complemented by robustness checks through the use of other approaches such as the VECM framework and the impulse response analysis.

The thesis is organized as follows: Chapter 2 reviews the theoretical and empirical literature on credit risk determinants and pays special attention to research undertaken on the focal countries of this thesis. Chapter 3 discusses the key developments in the economies and the banking sectors of Albania, Italy, Spain and Turkey, focusing mainly in the timeline investigated in this thesis (1998-2016). Individual problems will be surfaced which necessitate a country-by-country analysis. Chapter 4 outlines the dataset as well as the chosen methodological approaches whereas the empirical findings are presented in Chapter 5. Chapter 6 looks with a comparative eye at the findings achieved in the preceding chapter. Finally, Chapter 7 draws the conclusions of the work undertaken along with its limitations, provides policy recommendations and suggestions for further research in the area.

Chapter 2: Literature Review

Introduction

This chapter reviews the main theoretical contributions on the determinants of credit risk and discusses the relevant empirical literature by focusing initially on the international studies that investigate credit risk and then on the limited number of studies for the four focal countries, Albania, Italy, Spain and Turkey. Since these countries are part of Europe and therefore their financial progress is closely related to the history of the European banking system, this chapter starts with Section 2.1 that provides a brief history of the main developments in the European banking over the last forty years. Then, Section 2.2 discusses the key determinants of credit risk and their classification as suggested by the relevant literature, whereas Section 2.3 explores the empirical work in the area. The chapter is concluded by Section 2.4.

2.1 The European banking system

Considering that the research in this thesis is devoted to four European countries, prior to discussing the potential factors that affect the deterioration in the quality of banks' loans found in the literature, it is worth having a look at what happened in the European banking system over the last forty years; a period that includes the boom cycle, the GFC and the post-crisis interval which for Europe is defined as the European sovereign debt crisis.

The boom cycle of the European financial system (mid 1980s–2007) was characterized by a rapid pace of developments in information technology along with product/services innovations in financial markets (Staikuras and Koutsomanoli-Fillipaki, 2006). In order to be competitive, banking systems had to remove certain barriers of interaction with the international markets and to implement deregulatory reforms on the existing structure of banks. Such general trend in the financial services industry towards liberalization, regulatory reform, and globalization coincided with the process of European integration (Staikuras and Koutsomanoli-Fillipaki, 2006).

The deregulation of the European banking systems initiated in the 1980s and has marked one of the most important reforms in the history of the European financial market, whose effects are still discussed nowadays. According to Soros (2008), at that time regulations started to relax and to gradually disappear from the market. Elimination of controls on interest rates, fees and commissions, as well as on credit were among the key changes at the national level (Evans et al., 2008). The countries' interaction within the European Economic Community (EEC), which preceded the EU, was accelerated through the relaxation of restrictions on entry, the elimination of

capital controls as well as through the First and Second Banking Directives[9]. The creation of a single currency in 1999 aimed to enhance and better regulate the activity of the European financial market. According to Evans et al. (2008), the regulatory changes undertaken by the EU aimed at improving the competitive ability of the European banking market as well as to make it more homogenous across the region. They enabled European banks to expand rapidly into emerging economies. It was believed that the relaxation of barriers would create "a level playing field" among banking systems in terms of cost-effectiveness, profitability and asset-liability practices at the same cost of risk-taking. However, it is argued that financial liberalization, if not properly managed, can trigger an unsustainable lending boom (Noy, 2004). Indeed, this happens as liberalizing the financial markets implies letting the market free on determining the allocation of credit (Arestis and Sawyer, 2005). To this extent, financial liberalization routes followed by countries may be one of the reasons why their banking systems incur crises. The majority of the IMF member countries encountered several shocks in their banking systems since the start of the deregulation wave in the early 1980s (Arestis and Sawyer, 2005). Moreover, the fast pace through which financial liberalization spread into developing countries with previous overly regulated financial systems, without prudential supervision, accelerated high risk-taking incentives (Gorton, 2008).

Along with deregulation, technological change played a critical role in the integration of global financial markets and accelerated competition within them. The European banking system has been among the first (after the U.S.) to embrace financial innovation and therefore to be involved in a volatile business environment. The relaxation of barriers on entry eased the offering of financial services from foreign non-financial companies. As Staikuras and Koutsomanoli-Fillipaki (2006) argue, a considerable pressure for innovation in financial products, services and procedures started in the new millennium. The diversification of services by banks included complex financial instruments which became very attractive in the financial markets. According to Prorokowski (2013) though, these instruments did not offer international investors the expected shield in case of sudden shocks. As Soros (2008) puts it, things got out of hand for the regulatory authorities since the design of the new products was too complicated to be controlled and therefore the internal risk management methods of banking institutions became the only tool of risk supervision. Makri et al. (2014) argue that a major part of the academic literature agrees that the increased competition among banks negatively affected the quality of their credit portfolio in terms of inadequate loan monitoring and borrowing criteria. Likewise, Fiordelisi et al. (2010) argue that banks' risk-taking may arise from their objective to be competitive. As the authors state: "*This is because increased*

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[9] The First Banking Directive, which was adopted in 1977, encourages cooperation between the EEC nations in the establishment and regulation of credit institutions. The consolidated supervision directive requires two institutions in different countries to be regulated on a supranational basis if one owns more than 25% of the other. Finally, the Second Banking Directive, implemented on January 1993, created a single banking license throughout the EU.

competition reduces the market power of banks thereby decreasing their charter value. The decline in banks' charter values coupled with the banks' limited liability and the existence of 'quasi' flat rate deposit insurance could encourage banks to take on more risk" (Fiordelisi at al., 2010, p.6).

Indeed, the GFC that followed the big-boom of financial intermediation revealed that the pre-crisis developments were at the heart of the big turmoil. More precisely, banking system assets, credit and profits grew at a much faster pace than economic activity. Risk was often neglected and not properly assessed in bank strategies (BIS, 2018). Due to 'moral hazard' hypothesis and the 'too big to fail' theory, during the early 1990s - 2007 period, banks were relaxing by the shiny skies and the calm winds of the Great Moderation and therefore an overall atmosphere of relaxation characterized the banking systems of many countries at that time. The outset of the recent GFC though, caused enormous global turbulence.

The GFC that started in the U.S. in 2007 as a subprime mortgage crisis was a result of too much borrowing and neglected financial modeling, largely based on the assumption that home prices only go up. As the latter sharply declined and borrowers became desperate for money, credit crunch and huge mortgage loan defaults of the U.S. banks followed. The rapid pace through which the crisis was extended over the boundaries though, reflected an extremely high degree of interconnectedness among financial institutions and financial markets (Fong & Wong, 2012). Western European banks were the first to feel the crisis' burden transmitted directly by the superficially and inadequately monitored banks in the U.S. (Prorokowski, 2013). On the other hand, they expanded their services to Central and Eastern Europe through a wave of mergers and acquisitions among their domestic banks. The heavy reliance on foreign funding eased a spillover effect to the emerging economies (i.e. Romania, Bulgaria, Albania) through bank credit channels (Prorokowski, 2013; Popov and Udell, 2012).

At the edge of the GFC another crisis embraced Europe, namely the European debt crisis, which was initiated in the end of the year 2009, when the world realized that Greece could default on its debt. Since then, things only got worse and veteran members of the European Union such as Portugal and Spain would reach the edge of default on their sovereign debt if it wasn't for the bailouts initiated by the European Central Bank (ECB) and the International Monetary Fund (IMF)[10]. Although Italy was also deeply involved in the sovereign crisis, it is the only country among the GIPSI that did not secure a "rescue" program (bailout) from the European Union with the excuse that most of the government debt is held domestically by the Italian banks. Without aiming at deviating from the scope of our research which investigates the credit risk determinants in Albania, Italy, Spain and Turkey, emphasizing the current turbulence in the European core countries

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[10] Italy is the only country among the GIPSI countries (Greece, Italy, Portugal, Spain and Ireland) that has not received a bailout package.

and its link to the GFC provides the rationale for giving top priority to the determinants of credit risk in banking.

The next section identifies and classifies the factors that mostly affect credit risk as suggested by the theoretical literature. As the main foundations on the credit risk determinants will be build, it will be easier to comprehend the empirical studies that are reviewed in Section 2.3.

2.2 Theoretical literature: determinants of credit risk

This section reviews the determinants of credit risk found in the theoretical literature. As a measure of asset quality, studies usually use the NPLs ratio or the loan loss provisions ratio (LLPs hereafter). The ratio of new bad loans to the outstanding amount of performing loans in the previous frequency is also used in the relevant literature. According to the IMF (2004) NPLs definition, which is commonly used in the literature, a loan is classified as non-performing when:

- *"Payment of principal or interest is past-due by three months (90 days) or more,*
- *Interest payments equal to three months (90 days) interest or more have been capitalized (reinvested into the principal amount), refinanced or rolled over (that is, payment has been delayed by agreement), or*
- *Payments are less than 90 days past due but sufficient evidence exists to classify a loan as non-performing, such as when the debtor files for bankruptcy"*, (IMF, 2004, p.57).

LLPs on the other hand, are expenses set aside by banks in order to cover future losses on their loans (Quagliariello, 2004). Provisions are registered as an expense in the profit and loss statement. Besides, they reduce the book value of the assets since they are added in the balance-sheet to the loan loss reserves, which is a "contra-asset" account.

The flow of new bad loans to total performing loans is considered a more precise indicator of credit risk in Italy compared to the bad debts' stock, which can simply decrease with some loans' write-off (Quagliariello, 2004) and is also used as credit risk indicator in previous studies performed for Italy.

Credit risk determinants are distinguished in two main categories: macroeconomic-cyclical factors affecting systematic credit risk and bank-specific or institutional factors affecting unsystematic risk (Gila-Gourgoura and Nikolaidou, 2017). Macroeconomic factors are related to the business cycle and the effect that the latter has on borrowers' debt repayment capacity whereas the second category of variables is related to the microeconomic/banking industry environment and its effect on credit risk. Many studies devoted to credit risk determinants emphasize the high significance of a good macroeconomic performance to the quality of lending, more precisely, to a reduced number of NPLs. They agree on the pro-cyclical nature of credit risk, implying that while

the economy is doing well the risk on loan defaults is lower. Other studies though, prefer to focus on specific bank characteristics (e.g. lending growth, profitability and efficiency) in order to explain credit risk and as it will be outlined later on in this chapter, their findings are quite ambiguous, leading to contradictory findings among various countries. It is worth mentioning that only a few studies consider variables from both the macroeconomic and the microeconomic environment.

a. Macroeconomic environment

The literature that focuses on the relation between economic activity and asset quality is rich and diverse. The vast majority of studies agree on the negative relation between credit risk and economic growth, that is, on the pro-cyclical nature of credit risk. During favorable macroeconomic conditions, it is easier for borrowers to service their debts and therefore banks usually report less NPLs (Festic et al., 2011). Similarly, the provisions that banks put aside for difficult times are diminished during economic booms meaning that also in this case their behavior is pro-cyclical. (Cavallo and Majnoni, 2001; Nkusu, 2010). Cavallo and Majnoni (2001) though, argue that the provisioning policy that banks follow during economic upturns amplifies the negative effect of the downturns. Credit risk increases as the economy falls and the interest rates rise (Espinoza and Prasad, 2010). There is another view though, namely the counter-cyclical one, which is focused on the effect of credit growth on credit risk and claims that the latter is built up during periods of economic upturns and is only materialized during recessions (Borio et al., 2001; Lowe, 2002). Indeed, banking crises have usually succeeded booming periods characterized by generous lending to the economy (Jimenez and Saurina, 2006). The rationale behind this lies in the fact that, during good macroeconomic conditions, when assets' prices are high, banks apply looser credit standards motivated by their overestimation of the future loans' performance. Hence, risk appears to be low, but in reality, serious imbalances are building up that can later be the cause of harsh economic conditions (Lowe, 2002; Jimenez and Saurina, 2006). Consistently, Hilbers et al. (2001) argue that lending increases during the booming periods, particularly in the real estate sector, fueled by a sharp increase of property prices and the perception of a lower risk associated to them. A fall in the market value of the collateral though, will increase the bank's risk and worsen the financial position of its clients, in particular households and real estate companies. Salas and Saurina (2002) conclude that steady growth is the best macroeconomic policy that could keep NPLs at a low level, considering that a too-rapid growth would be associated by an accelerating credit expansion that would only lead to financial distress later. The expected effects of the main macroeconomic indicators are explained below in detail.

Notably, periods of sustainable economic growth are characterized by higher standards of living, an increased number of available jobs and thus, an improved capacity of borrowers to service their debts. Given this, good economic conditions reflected in greater values of GDP growth will be associated by less defaults on loans thus, lower NPLs (Messai and Jouini, 2013; Gila-Gourgoura and Nikolaidou, 2017). Adversely, periods of recession when the unemployment increases, negatively affect incomes of individuals but also of corporates that have to adjust to fewer sales of their products and consequently lower cash-flows (Chaibi and Ftiti, 2015). Therefore, a hike in the unemployment rate is related to a higher credit risk.

Interest rates and inflation rates are other macroeconomic factors considered most relevant to credit risk, by the existing literature. As interest rates increase, the likelihood that borrowers will run into debt servicing problems increases (Nkusu, 2011). Demirgüç-Kunt and Detragiache (1997) suggest that while GDP growth has a negative effect on credit risk, the real interest rate and the inflation rate are positively related to it. However, the effect of inflation rate on credit risk results ambiguous in the relevant literature. Higher inflation rates make loans cheaper thus, servicing their debts becomes easier to borrowers (Castro, 2013; Gila-Gourgoura and Nikolaidou, 2017). If high inflation though, is associated to an increase in interest rates as lenders attempt to protect themselves from a future increase in prices, the hike in borrowing costs will put borrowers in serious trouble (Castro, 2013). Overall, periods of high-inflation are characterized by uncertainty about what the future preserves in terms of prices' and incomes' levels and therefore businesses and consumers are more damaged than aided by high inflation.

Similarly to interest rates and the inflation rate, the exchange rate is also included in the group of potential macroeconomic determinants of credit risk. Its effect on NPLs though, is ambiguous, especially in the countries where loans are mostly granted in foreign currency (Gila-Gourgoura and Nikolaidou, 2017). A domestic currency appreciation may negatively affect the competitiveness and profitability of exporting companies and therefore, may weaken their financial position and reduce their chances of being further financed by banks (Castro, 2013; Nkusu, 2011). In contrast, domestic currency appreciations may prove profitable to borrowers that service foreign currency loans (Mishkin, 1996; Nkusu, 2011). Indeed, in banking systems with a high percentage of loans denominated in foreign currency, any depreciation in the latter would improve the borrowers' loan repayment capacity (i.e. South Eastern Europe) (Gila-Gourgoura & Nikolaidou, 2017). Hence, depending on the share of foreign currency loans in a country's banking system, exchange rate volatility may have various effects.

Stock markets and property prices are two other potential credit risk determinants, suggested by the literature. The stock markets' performance relies upon the investors' perception of various

events in the global environment and the effect that they may have on the economy and financial system of a country (Jakubik and Reininger, 2013). Therefore, the link between stock markets and credit risk is expected to be negative. Similarly, a fall in property prices creates turbulence in the financial systems (Hilbers et al., 2001). Indeed, the 2007 subprime crisis in the U.S. revealed that the downturn in the real estate market was associated to higher interest rates on mortgage loans and huge losses on borrowers while trying to resell their houses. As a result, the borrowers' capacity to service their loans considerably deteriorated and therefore credit risk increased.

To summarize, the theoretical considerations suggest that credit risk is tightly related to macroeconomic stability and that banks follow cyclical behavior. However, an accurate credit risk modeling includes also other variables in the equation, despite the macroeconomic ones (Llewellyn, 2002; Beck et al., 2013). Specifically, a range of comprehensive studies presented below, have focused on banking industry-specific variables as well and agree that banks' weaknesses often accelerate credit risk.

b. Bank-specific indicators

As explained previously, the global banking industry and in particular the European one, experienced structural changes in terms of regulation and financial innovations over the last decades, thus, the quality of its loans could not remain stable. Given this, bank-specific features that are considered potential drivers of credit risk gained major interest in the aftermath of the GFC. More precisely, the amount of studies that put the banking-industry variables to the forefront during credit risk investigation, expanded in the crisis' aftermath.

According to the literature, various variables from the banking-industry environment that are expected to affect credit risk are: total credit and/or its growth, banks' capitalization, banks' efficiency, as well as the banks' profitability (Gila-Gourgoura and Nikolaidou, 2017). Notably, excessive credit has been a persistent event prior to banking crises (Castro, 2013). Indeed, the rise in subprime mortgage loans prior to the 2007 crisis in the U.S., showed that generosity in lending is followed by deterioration in its quality and a not so generous lending policy once the crisis has begun (Ali and Daly, 2010). Keeton (1999) attributes higher loan losses to loan growth when banks lower credit standards and reduce interest rates. As a result, credit rises while its quality falls. If loan growth increases for reasons other than a relaxation of credit terms and conditions (i.e. as a result of higher productivity), the expanded credit may not be subject to higher defaults (Keeton, 1999). It is worth mentioning that, a high level of NPLs, combined with deteriorated economic conditions will motivate banks to tighten lending and therefore enlarge the negative effect of the downturn, by leaving unfinanced profitable projects.

The effect that banks' capitalization has on credit risk is linked to the 'moral hazard' hypothesis and the banks' appetite for riskier and more profitable projects, which persuades them to keep lower levels of capital. Consequently, low capitalization is linked to more NPLs (Berger and DeYoung, 1997; Gavin and Haussmann, 1996). Empirical evidence though, has proved that also the adverse relation is quite possible since even well-capitalized banks may undertake substantial risk to counterbalance the cost of keeping funds uninvested (Makri et al., 2014; Gila-Gourgoura and Nikolaidou, 2017). To this extent, there is no clear-cut answer on whether well-capitalized banks are exposed to lower or higher credit risk.

Several banks may prefer riskier projects that generate higher revenues as to compensate for their costly capital levels (Fiordelisi et al., 2011). Similarly, Koehn and Santomero (1980) and Kim and Santomero (1988) argue that, flat capital requirements give banks an incentive to invest in riskier portfolios and therefore increase their probability of failure instead of reducing it. According to Blum (1999), capital requirements imposed by regulatory authorities may increase credit risk. Calabrese et al. (2014) claim that prior to the GFC, many bank were recapitalized due to the high wave of mergers and acquisitions among them but instead of showing a risk-averse behavior they became more aggressive.

The efficiency-credit risk ambiguous relationship is clearly explained by Berger and DeYoung (1997). Firstly, the authors suggest a negative relationship between bank efficiency and credit risk based on two hypotheses: 'the bad management' and the 'bad luck' hypothesis. Specifically, inefficient banks tend to pay less attention to risk assessment and monitoring due to a continuous negligence from the management and therefore aid the creation of NPLs. Adversely, when the latter are caused from other factors rather than the bank's low efficiency, banks have to allocate more resources and efforts in improving the quality of their loans at the cost of their efficiency. Secondly, the authors suggest a positive efficiency-risk relationship based on the 'skimping' hypothesis. More precisely, efficient banks may underestimate allocating sufficient resources to credit risk management thus, favor the default of their loans.

Louzis et al. (2012) claim that profitability ratios such as ROA and ROE may also have an ambiguous effect on credit risk, explained by the bad management and pro-cyclical credit policy hypotheses (Gila-Gourgoura and Nikolaidou, 2017). Low profitability is usually related to inadequate management either because the bank may not afford a better one or simply due to unfortunate selection of managers. In both cases, bad management will be characterized by less expertise in credit and the risk associated to it and thus, will likely be associated with more defaults on the granted loans. The pro-cyclical credit policy hypothesis claims that the higher a bank's earnings and the better its managers' performance the more biased are the bank's risk-incentives

and projects for future investments. As the successful managers are eager to maintain a good reputation in the banking industry and thus, report impressive profitability ratios, they may underestimate credit risk and engage in riskier loans with a greater chance of default. To this extent, as it will be observed also in the upcoming empirical literature, the effect of ROA and ROE on NPLs may be positive or negative.

To summarize, the above review of the main theoretical underpinnings on the determinants of credit risk underlines that both macroeconomic and bank-specific factors matter to loans' quality. Despite the fact that several studies focus on the business cycle implications for credit risk whereas others try to explain it based on institutional (bank-specific) factors, better results are achieved when both sets of factors are considered in a study (Bonfim, 2009; Kaminsky and Reinhart, 1999). Beyond any reasonable doubt though, a single-country analysis is the most accurate way of capturing these effects; the vast majority of studies agree that credit risk decreases when there is growth or increases when there is generosity in lending, however, country-specific features have to be considered to account for economic policies, financial systems' evolution, historic events and geographic positions.

The following section provides a detailed analysis of the wealthy empirical literature that investigates the determinants of credit risk. Examining these studies in terms of the methodology applied, country/group of countries analyzed and findings achieved, will help perceive the advantages of single-country analysis and answer the question why our research has chosen this approach.

2.3 Empirical evidence: credit risk determinants

Based upon the key theoretical considerations on credit risk determinants that were discussed previously, this section focuses on the most influential empirical studies devoted to the issue. These studies' findings vary according to the countries investigated, methodologies employed and variables considered. Among the years, data availability has played an important role in determining the country/group of countries analyzed, the methodologies followed as well as the potential credit risk drivers. According to Gorton (2012), it has been quite difficult to analyze crises occurred among the years and the impact they may have on various economies due to lack of relevant data. For this purpose, many studies focus on a group of countries, rather than treating each one as a case study. However, cross-country studies mask the idiosyncratic features of each country that may play a critical role on its credit risk. Prior to discussing the various studies that have tried to explain credit risk for a group of countries or for single countries, it is worth having a look at the broad methodologies followed on modeling credit risk.

A fundamental part of the empirical investigation of credit risk is related to stress-testing[11] of bank balance-sheets (Beck et al., 2013). According to Jakubik and Sutton (2011), macro stress tests usually estimate the losses that a group of large banks could suffer under adverse macroeconomic developments or other shocks.

According to Sorge and Virolainen (2006), the two kinds of stress-tests most commonly applied in the relevant literature:

- *"balance-sheet models, focusing on the link between banks' accounting measures of vulnerability (such as NPLs and LLPs) and the business cycle;*
- *value-at-risk models, combining the analysis of multiple risk factors into a probability distribution of mark-to-market losses that the banking system could face under a stress scenario"* (Sorge and Virolainen, 2006, p.115).

The value-at-risk model is a data-intensive approach which aims to analyze the impact of macro factors on the corporate and/or household sector default risk and map these developments into banks' loan losses under a mark-to-market framework (Sorge and Virolainen, 2006). The biggest shortcoming related to this approach is the non-additivity of value-at-risk measures since the latters computed as vulnerability indicators of single portfolios or financial institutions, cannot be simply summed up to provide a picture of systemic risk[12] (Sorge and Virolainen, 2006). Given this, the major part of the relevant empirical literature is widely focused on the balance-sheet approach to examine the link between banks' credit risk and macroeconomic factors. Sorge and Virolainen (2006) claim that balance-sheet models are classified as follows:

- Time-series or panel data techniques, and
- models that analyze the vulnerability of the banking system to changing macro fundamentals in the context of economy-wide structural models.

Time series analyses estimate the vulnerabilities of a banking sector over time whereas panel studies are focused on aggregate banking systems for a group of countries or a group of individual banks of a single country (Sorge, 2004). On the other hand, structural models are usually applied by central banks in decision making.

There is a vast majority of studies relying on the VAR methodology to examine the links between credit risk and it potential explanatory variables. These studies are typically focused on a few macroeconomic variables that are expected to affect credit risk and vice versa. The advantage of the VAR lies in the possibility to estimate changes in credit risk in the quarters following adverse

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[11] These tests have been performed as part of the Financial Sector Assessment Programs (FSAPs) of the IMF and World Bank as well as by the financial sector supervisors, central banks and the financial institution itself under the control of the latter (Jakubik and Sutton, 2011).

[12] Like this, it is impossible to capture the risk of domino effects among single financial institutions.

business cycle shocks (Hoggarth et al., 2005b). Moreover, it allows for a feedback effect from credit risk to the macroeconomic environment. Thus, VAR models are more flexible and a relatively simple way to produce a set of mutually consistent shocks (Foglia, 2008).

On the other hand, the Autoregressive Distributed Lag (ARDL) approach to cointegration, firstly developed by Pesaran and Smith (1998) and Pesaran and Shin (1999), is applied by a limited number of studies to uncover credit risk determinants. This approach though, holds certain advantages compared to the other cointegration techniques employed in the literature, thus, for this purpose is the approach applied in this research. Applying the ARDL cointegration framework does not necessarily require prior unit root testing, typically preceding the cointegration analysis, since it provides robust results on variables of mixed orders I(0) or I(1) of integration and significantly reduces the probability of spurious regressions (Shahbaz and Islam, 2011; Gila-Gourgoura and Nikolaidou, 2017; Ghouse et al., 2018). This feature of the ARDL approach is particularly functional in studies using macroeconomic variables among other kinds, as they typically contain one unit root.

Moreover, in contrast to other econometric techniques, the ARDL framework allows various variables to appear in different lags that are chosen on the basis of standard criterion such as Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC) (Mallick and Agarwal, 2007; Ghouse et al., 2018). Furthermore, the error correction model (ECM) of the ARDL equation determines both the short- and the long-run relationship between the variables in the model without losing long-run information since it uses both the variables' differences and their lagged values (Gila-Gourgoura and Nikolaidou, 2017).

Having touched upon the mechanism through which empirical studies on credit risk determinants are performed, the remaining sections of this chapter discuss the diverse empirical findings achieved. Section 2.3.1 reviews the panel data studies, followed by Section 2.3.2 which is focused on the single-country analyses and is finalized by the discussion of the existing studies devoted to the focal countries of our research.

2.3.1. Panel data studies

The panel data matrix set allows the inclusion of a time series for each cross-sectional member in the data set and offers a variety of estimation method (Asteriou and Hall, 2007). Panel models commonly used in the existing literature that investigates credit risk are: fixed effects, random effects and the Arellano and Bond (1991) two-step dynamic Generalized Method of Moments (GMM) estimation. According to Elhorst (2003), the use of panel data results in less collinearity among the variables and a greater availability of degrees of freedom. Therefore, results achieved are

quite efficient. However, the biggest problem related to panel data models is the heterogeneity of parameters among various countries. Hence, they may not capture country specificities that are highly relevant to credit risk. The mean group (MG) and the pooled mean group (PMG) estimators, firstly proposed by Pesaran et al. (1999), are used by researchers as a solution to the bias created by the heterogeneous slopes in dynamic panels thus, they are often preferred to the traditional panel data methods such as GMM (Asteriou and Hall, 2007). However, as it will be clearly outlined below, most of the panel data studies on credit risk have short time spans and thus using MG and PMG estimators may lead to misleading results. Researches though, try to account for structural breaks or create sub-groups which are supposed to have the same data generation process, reducing however furthermore the studies' time span.

For instance, Beck et al. (2013) apply fixed effects, random effects and the Arellano and Bond (1991) estimation techniques to investigate the NPLs determinants for a large panel of 75 countries, over the period 2000-2010. Despite agreeing that slow GDP growth and high interest rates are the main drivers of bad loans among the analyzed countries, the authors argue that country- or sector-specific factors which cannot be captured in a panel data study may be crucial in determining NPLs. More precisely, exchange rate depreciations negatively affect the loans' quality in countries with a high percentage of foreign currency lending whereas the opposite occurs in those countries with a dominant domestic currency lending. Furthermore, low share prices have a larger effect on NPLs in countries with developed stock markets.

Similarly to Beck et al. (2013), the study performed by Jakubík and Reininger (2013) for nine Central East and South East European (CESEE) countries, over the period 2004Q1-2012Q4, concludes on a negative relationship between share prices and NPLs and uncovers the link that exists between exchange rates, foreign currency loans and bad loans. The negative effect of local currency depreciation on the latter varies, depending on the share of the foreign currency loans in total loans: the higher the share the biggest the effect. The authors admit though, that the countries included in their panel, despite their geographic proximity manifest differences in the quality of regulatory institutions, the loan repayment policy and market standards. As a result, this study's findings may not relate to the actual problems that each CESEE country faces with NPLs given that country-specific factors should be considered in their investigation.

Athanasoglou (2011) also create sub-samples of banks, according to their level of capitalization when a panel of South East European (SEE) banks (including Albanian ones) is investigated, over the time period 2001-2009. Findings suggest a bi-directional causality between bank capital and credit risk in banks with low capital, whereas in banks with adequate capital levels, their relationship is not significant.

Chaibi and Ftiti (2015) and Ali and Daly (2010) performed country-specific comparative studies by investigating the credit risk determinants of Germany and France and the U.S. and Australia respectively. Chaibi and Ftiti (2015) apply the two-step GMM technique (Arellano and Bond, 1991) for a panel of French and German banks, over 2005-2011 and conclude that all the macroeconomic variables included in the model (GDP growth, interest rate, unemployment rate, and exchange rate) matter to credit risk of both the countries. Moreover, banking credit risk in France is significantly affected by the inflation rate and bank-specific determinants than in Germany and therefore, the importance of specific features comes again to the forefront. Results achieved by the study of Ali and Daly (2010) for the period 1995-2009, suggest that macroeconomic factors such as economic growth, interest rates and total debt impact credit risk of both Australia and the U.S. However, the U.S. economy appears to be more vulnerable to unfavorable macroeconomic shocks.

Babihuga (2007) focused on a highly heterogeneous group of countries (96 countries of Europe[13], Asia and Sub-Saharan Africa) and investigated the link between macroeconomic variables, the quality of bank supervision[14] and financial stability indicators (capital adequacy, NPLs and profitability), over the very short time period 1998-2004. The relationship between NPLs ratio and the macroeconomic and banking industry characteristics is investigated based on 4 specifications: pooled OLS, fixed effects, random effects, and the Anderson-Hsiao 2SLS models. It is concluded that business cycle, the inflation rate, the real exchange rate and interest rates matter to NPLs, although on various degrees depending on certain country-specificities such as income, financial system's development, the quality of bank regulation and market concentration. To account for these specificities, Babihuga (2007) introduces interaction terms between the business cycle and dummy variables controlling for cross-country differences[15]. "Interaction terms are useful tools for inferring how the effect of the business cycle on financial soundness indicators (FSIs) might depend on the magnitude of other variables, in particular differentiating characteristics across countries" (Babihuga, 2007, p.10). Findings suggest that the impact is not the same among countries; the negative effect of the business cycle (the cyclical component of real GDP) on NPLs appears to be stronger in countries with less developed financial systems, rather than in those that are more financially advanced. To this extent, the author suggested further extensions of her study and raised concerns whether the country-specific factors are the ones that matter most to the accurate analysis of credit risk determinants.

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[13] including Italy, Spain and Turkey

[14] The quality of bank supervision is measured by an index of compliance with the Basel Core Principles (Babihuga, 2007).

[15] Three dummies are constructed for each category: low income (D1), middle income (D2) and high income (D3) countries (Babihuga, 2007).

Overall, the above mentioned studies attempt to account for heterogeneity in their panel estimations, based on various criteria. Still, the authors admit that results may be biased, considering the high relevance on credit risk of idiosyncratic features that may not be captured in a panel data model.

A strand of panel data studies relies on the VAR approach to explore the link between NPLs and the macroeconomic environment. Espinosa and Prasad (2010), investigate a panel of 80 banks in the Gulf Cooperation Council region, over the period 1995-2008. According to their findings, low economic growth and high interest rates increase NPLs in the region. Moreover, a short-lived adverse feedback effect is observed, from NPLs on growth. By using a panel VAR on 26 advanced economies (including Italy and Spain) over the period 1998 to 2009, Nkusu's (2011) findings suggest a positive relationship of growth contraction and unemployment with credit risk. Furthermore, the impulse response analysis reveals that sharp increases on NPLs lead to economic downturns. More precisely, an increase on NPLs is associated to growth contraction and a rise in unemployment (Nkusu, 2011).

Other panel data studies are focused on groups of countries that are considered quite similar in terms of their economic and financial development stage such as: the developed countries of the Eurozone, the GIPSI countries or the emerging economies. It is worth mentioning that, only a few studies account for heterogeneity, in their models. Castro (2013) investigates NPLs determinants in the GIPSI countries. Using fixed effects, random effects and the Arellano and Bond (1991) estimator, the author concludes that credit risk in the GIPSI countries is sensitive to changes in unemployment, the real exchange rate, GDP growth, share price indices, interest rates, and credit growth. It is worth noting that, considering the long time span investigated (1997Q1-2011Q3), the robustness of the results is checked by the use of the PMG estimator, which derives the same findings with the Arellano and Bond (1991) estimator. Therefore, Castro (2013) results provide useful insights for regulators and policymakers in the GIPSI countries. Using panel cointegration techniques, Rinaldi and Sanchis Arellano (2006) try to define household NPLs for a panel of seven euro area countries (including Italy and Spain), over a period spanning from 1989Q3 to 2004Q2. Results suggest that in the long-run, a higher debt to total household disposable income ratio is associated to bigger delays in payments. If the increase in the households' indebtedness though, is accompanied by an increase in their income, NPLs remain untouched. Furthermore, it is concluded that increases in housing prices are accompanied by less NPLs in the short term.

Messai and Jouini (2013) and Makri et al. (2014) achieve similar results after investigating euro area countries. Specifically, by applying the Arellano and Bond (1991) two-step GMM approach, Makri et al. (2014) find a significant positive relation of NPLs with public debt and the

unemployment rate and a negative one with GDP growth, capital adequacy ratio and return on equity, for 14 Eurozone members over the period 2000-2008. By using fixed effects and random effects estimations, Messai and Jouini (2013) conclude that during the period 2004-2008, GDP growth and the return on assets negatively affected NPLs in Greece, Italy and Spain. The opposite effect though, is achieved by the unemployment rate, the loan loss reserves to total loans and the real interest rate.

Using fixed effects and random effects techniques, Festic et al. (2011) investigate credit risk drivers for the period 1995-2008 for the Central and Eastern European (CEE) countries. Their findings suggest that there is a positive relationship between economic booms and the quality of loans' portfolio. Furthermore, the latter is improved by the appreciation of the real effective exchange rate, given that the share of loans granted in foreign currency (Euro) by the CEE banks is quite high. Lastly, the authors conclude that accelerated lending growth can harm the performance of banks' activity. Focused on the timeframe 1998-2011, Klein (2013) concludes that in Central, Eastern and South-Eastern Europe (CESEE) NPLs are subject to change in both macroeconomic and bank-specific variables, namely, GDP growth, unemployment and inflation rate, profitability ratios and banks' capitalization. Moreover, similarly to what was concluded in the studies of Espinoza and Prasad (2010) and Nkusu (2011), there is a feedback effect from NPLs on the macroeconomic environment, implying that as banks incur loan losses and lending is shrunk, the economy enters recession (Gila-Gourgoura and Nikolaidou, 2017). The study by Kakvler and Festic (2012) focuses on Bulgaria and Romania over the 1997-2008 timeframe and concludes that when based on external debt, large current account deficits may cause deterioration in the quality of banks' loans.

A few panel data studies have picked the loan loss provisions ratio as a measure of credit risk (Laeven and Majnoni, 2003; Glen and Mondragón-Vélez, 2011). Applying the Arellano and Bond (1991) two-step GMM approach, Laeven and Majnoni (2003) investigate a large sample of 45 countries (where Italy, Spain and Turkey were included), over the period 1988-1999. Findings agree with the other studies on the procyclicality of banks since loan loss provisions and economic growth appear to be negatively related. Banks tend to postpone loan provision during smooth economic times and delay it until it is too late. Glen and Mondragón-Vélez (2011) investigate the determinants of loan loss provisions on Latin American countries and other developing countries (including Turkey) over the period 1996-2008 and similarly to Laeven and Majnoni (2003), they conclude that loan loss provisions are mainly driven by slow GDP growth rather than by growing interest rates. Furthermore, the high indebtedness of the private sector and a poor capitalization of the banking system increase loan loss provisions in the investigated developing economies.

2.3.2 Single-country analyses

As mentioned in the previous sub-section, the main problem associated with panel data studies is the failure to capture country-specific variables that may be highly significant to credit risk. Given this, single-country analyses become handy in identifying country-specificities. Since these studies have the feasibility of including idiosyncratic characteristic in their models, their findings are more thorough compared to those derived from panel data studies.

A considerable number of single-country studies rely on the VAR approach, aiming to investigate not only the determinants of credit risk but also the effect of the latter on the business cycle. Hoggarth et al. (2005b) investigate the link between the output gap[16], retail and house price inflation, nominal short-term interest rate, the real exchange rate and loan write-offs[17] in the UK, for the period 1988-2004. Their results suggest a significant and negative effect of shocks to the output gap on the write-off ratio, with the maximum impact occurring after one year. However, no feedback effect is found between the two. In contrast, the retail price inflation and the nominal interest rate seem to positively affect loan write-offs and vice versa.

Through the use of VAR on monthly data from 1993-2006, Baboucek and Jancar (2005) investigate the effects of a wide range of macroeconomic variables[18] on the NPLs of the Czech banking system and based on impulse response analysis provide empirical evidence that highlights the importance of country-specificities on credit risk. Specifically, NPLs are found to be positively affected by unemployment and the inflation rate whereas M2, the exchange rate and the loans' growth are not significant to NPLs as evidenced in similar studies. Moreover, Baboucek and Jancar's (2005) findings indicate a weak feedback between NPLs and credit expansion whereas a robust causality exists between NPLs and the unemployment rate. In contrast to Baboucek and Jancar's (2005) study, the linear regressions performed by Jakubik (2007) between NPLs and macroeconomic and bank-specific variables over the period 1997-2005, suggest that NPLs of the corporate sector increase with the appreciation of the real effective exchange rate and as well as with a rise in the loan to GDP ratio; meanwhile, the default rate for households increases via unemployment and interest-rate increases.

Also through the use of VAR, Gambera (2000) investigates the explanatory power of a set of macroeconomic factors on the non-performing loans of a large sample of US banks for the period 1987-1999. His findings suggest that the loans quality is significantly affected by the unemployment rate, construction permits as well as the income generated from farming. On the

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[16] Output gap is calculated as a difference between the actual and the potential GDP.
[17] Bank write-offs are the losses reported by UK-owned banks on loans initiated from their UK-resident banking operations (Hoggarth et al., 2005b).
[18] Unemployment, M2, trade balance, the real effective exchange rate, CPI, domestic real 3-month interest rate, aggregate bank loans to clients, and the share of NPLs in aggregate bank loans to clients (Baboucek and Jancar, 2005).

other hand, Berger and DeYoung (1997) conclude to a unidirectional causality from cost efficiency to problematic loans, for a panel of US banks. Louzis et al. (2012) confirm that the quality of loans in Greece is negatively affected by high interest rates and unemployment. Moreover, management inefficiency seems to play a crucial role in increasing NPLs. Monokroussos et al. (2016) explore the bad loans' drivers in Greece over the period 2005-2015, based on a diverse dataset of macroeconomic and banking-related variables. They conclude that high unemployment and contractions in the economic activity increase NPLs in the Greek banking system. Moreover, a significant negative feedback effect of NPLs in both GDP growth and employment is found. The authors find no evidence in support of the hypothesis assuming that excessive lending undertaken by major banks contributed to the low quality of loans reported by the Greek banking system.

The Austrian banking system has been investigated by Arpa et al. (2001) and Kalirai and Scheicher (2002). Specifically, they focus on LLPs and try to identify their determinants based on univariate and multivariate regressions. Arpa et al. (2001) conclude that GDP growth and interest rates are negatively associated to risk provisions whereas real estate prices have the adverse positive effect. Kalirai and Scheicher's (2002) provide evidence on other determinants of LLPs in Austria. More precisely, business confidence, a fall in the stock market price and the deterioration in the industrial production have a negative impact on LLPs.

As far as studies employing the ARDL approach to cointegration are concerned, they are few in number compared to those that apply other econometric techniques. Greenidge and Grosvenor (2010) apply the ARDL approach to explore what determined credit risk in the Barbados during the 1996-2008 timeframe. The authors conclude that in the long run, NPLs are sensitive to interest rates. Nikolaidou and Vogiazas (2013) apply the ARDL approach to cointegration on the Romanian NPLs and a set of macroeconomic and bank-specific variables over the period 2001M12-2010M11. Their results suggest that while loans growth and unemployment positively impact NPLs both in the short and in the long run, money supply (M2) has the adverse effect on credit risk. Similarly, NPLs in the Bulgarian banking system are subject to changes in both the macroeconomic and the banking-industry environment but they also depend on exogenous factors such as the Greek debt crisis (Nikolaidou and Vogiazas, 2014). While focusing separately on the banking systems of five Sub-Saharan countries, over various time intervals (due to restrained data availability), Nikolaidou and Vogiazas's (2017) results of the ARDL approach suggest that with the exception of money supply that has a significant negative effect on NPLs in all the investigated countries, the explanatory power of the other macroeconomic and industry-specific variables varies among them, in other words, is country-specific.

With regard to the focal countries of our investigation: Albania, Italy, Spain and Turkey, a review of the existing single-country analyses performed for each one of them follows.

a. Albania

There are a few studies that investigate credit risk determinants in the Albanian banking system. They are limited in terms of both the methodology applied and the size of dataset used. Shingjergji (2013a) used the simple regression model to estimate the relationship between NPLs ratio and several bank-specific factors, for the period: 2002-2012. Results indicate that loans to assets ratio and the return on equity are negatively related to NPLs ratio whereas the adverse relation is observed with total loans volume and the net interest margin. The author also considered the effect of macroeconomic variables on NPLs over the period 2005-2012 (Shingjergji 2013b) and concludes that in contrast to theory and the international empirical evidence, GDP growth is positively related to NPLs in Albania. Moreover, interest rates and the Eur/Albanian Lek exchange rate seem to have a positive relationship with NPLs whereas the opposite effect is concluded for the inflation rate – NPLs relation. Similarly, based on the multivariate linear regression, Gabeshi (2017) concludes that NPLs in Albania are positively affected by the real effective exchange rate and interest rates over the period 2005-2014. The effect of GDP growth though, is negative and in line with the main body of literature. Gremi (2013) employs the simple regression model on a panel of banks over the period: 2005-2013, to conclude that GDP growth and NPLs are negatively related in Albania whereas the opposite is observed for the relation between NPLs and the interest rates.

It becomes obvious from the above, that the existing studies that investigate credit risk in the Albanian banking system focus on short time-periods and lack the use of advanced econometric techniques; they base their investigation on simple OLS regressions and estimate static models, unaccompanied by alternative econometric models/tests (i.e. cointegration analysis) that would help achieve more accurate results. According to Inder (1993), if there is any possibility that the true relationship includes lagged values of variables, it is unwise to use the OLS regression to estimate and perform tests on the parameters given that the estimates can contain substantial bias and test statistics are hopelessly unreliable. Therefore, long-run relationships should be derived from dynamic models rather than static ones. To this extent, investigating the Albanian credit risk through the use of alternative econometric techniques that consider dynamics such as the ARDL approach to cointegration is a necessity, given that its relationship to the explanatory variables may include also their lagged values.

b. Italy

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. An unbalanced panel of 207 Italian intermediaries is selected, whose accounting ratios are available for at least 5 consecutive years in the period between 1985 and 2002[19]. Credit risk is measured by two distinctive indicators: the flow of new bad loans and loan loss provisions. 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. Moreover, some bank-specific variables (the loans stock and the return on assets ratio) are found to be significant to both the indicators of credit risk, confirming the view that the latter is a result of the interaction between the macroeconomic and the microeconomic environment (Quagliariello, 2004).

This study is extended by Marcucci and Quagliariello (2008), employing VAR methodology to test whether the feedback effect from the new bad loans to economic performance applies, over the period 1989-2004, for the same panel of banks considered by Quagliariello (2004). The business cycle indicators included in the study are: output gap, inflation rate, 3 month interbank interest rate and real exchange rate In line with the previous study, a significant first round effect[20] is found confirming that procyclical nature of the default rates, which rise and fall in parallel with the weakening and the strengthening of economic conditions. These findings hold for the aggregate model and two sectoral models divided into the household and the corporate sector. The study though, failed to find a feedback effect from the flow of new bad loans to the macroeconomic variables.

In contrast to Marcucci and Quagliariello (2008), Filosa's (2007) results indicate that the procyclical trend of bad loans in Italy is overestimated in the preceding studies. By estimating three distinctive VAR models, each based on different indicators of banks' soundness: the ratio of the flow of new bad loans to outstanding loans in the previous quarter, the stock of NPLs to total loans and the ratio of interest margins to outstanding loans, over the period 1990Q1–2005Q4, the author concludes that the relationship between credit risk and the macroeconomic environment is weaker than expected. His model of explanatory variables consists of the output gap, the year-on-year inflation rate, the spread between loan and deposit rates and the log of the positive free capital-to-loans ratio whereas the ECB's short-term interest rate and the effective exchange rate are considered as exogenous variables since they derive from the policies determined from the

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[19]The sample of the explanatory variables consists of: the GDP growth, which is used as a direct estimator of business cycle, the 10-year Treasury bond rate, the spread between loan and deposit rates and the evolution of the stock exchange index that proxy financial markets. Loan growth, the cost to income ratio and the return on assets are the bank-specific indicators used (Quagliariello, 2004).

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

European Union rather than from the Italian economy itself. Results indicate a weak procyclicality of the three financial soundness indicators. Positive shocks on the spread between loan and deposit rates increase both the new bad loans and the NPLs stock whereas the inverse negative effect is observed by increases in the degree of capitalization of banks. Lastly, changes in the exchange rate have e weak effect on the flow of new bad loans.

In contrast to the finding of Filosa (2007), that well capitalized banks have a lower credit risk, Chiorazzo et al. (2014) that analyzed 38 Italian banks over the period 2006-2012, have provided evidence that an increasing interest income and a higher capital to assets ratio are associated to a higher credit risk in the Italian banking system.

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 the new bad loans ratio for households falls when the real GDP and the real estate prices increase whereas the opposite occurs when there is a rise in unemployment and the short-term nominal interest rate. Similarly, the new bad loans ratio for firms is positively affected by the unemployment rate and the ratio of net interest expenses to gross operating profits. Adversely, the annual growth rate of durable goods consumption negatively affects the new bad loans ratio of firms.

By employing the ARDL model, Albertazzi et al. (2013) study the effect of the Italian sovereign debt crisis spread (calculated as the difference between the 10-year Italian government bond yield and the corresponding German one) on various indicators of the Italian banks' performance, including loan loss provisions, over the period 1991-2011. Their results suggest a negative effect of the debt crisis spread on loan loss provisions.

Anastasiou (2017) employs fixed and random effects and a dynamic GMM estimation to investigate the effects of business cycle and credit cycle to the NPLs ratio of 47 banks in Italy, by using quarterly data over the period: 1995-2014. Findings suggest a weak impact of business cycle (measured by GDP growth) on the quality of loans in Italy, more precisely, such effect is significant only in the dynamic level. Besides, it is found that credit cycle (measured by credit to private sector) is highly significant to NPLs 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 which indicates a stronger causal effect of credit cycle on NPLs ratio, rather than the effect of business cycle.

It appears from the above mentioned studies that empirical evidence on the explanatory power of macroeconomic and bank-specific variables on credit risk of the Italian banking system is not consistent. Results are mixed and while some studies agree on a stronger effect of bank-specific

variables on credit risk measured either by the new bad debts rate, NPLs or loan loss provisions, others emphasize the high significance of business cycle. Findings of Filosa's (2007) research highlight that the considerations on banking procyclicality in Italy are exaggerated; they provide evidence that the solvency of Italian banks would deteriorate only as an outcome of extreme macroeconomic shocks. In contrast, Quagliariello's (2004) study concludes that banks follow a cyclical trend since bad debts, provisions and loan losses are notably low during growth and increase during recessions.

Moreover, the majority of studies do not rely simultaneously on the macroeconomic and the banking-industry environment to explain credit risk in Italy; they focus either on macroeconomic variables or on bank-specificities only. To this extent, this study will add to the existing literature by considering both macroeconomic and bank-level variables in determining credit risk in Italy over an extended time period to the one investigated in the previous studies. This way, idiosyncratic features highly relevant to credit risk, that were unfolded by recent events not included in the timeframe of the previous studies, will be captured in this study (i.e. the sovereign debt spread calculated as the difference between the Italian and German 10-year government bond yields).

c. Spain

As far as Spain is concerned, the study performed by Salas and Saurina (2002) is among the few ones in the international literature that considers both macroeconomic and bank-specific variables to explain credit risk. By applying the Arellano and Bond (1991) estimator for dynamic models at bank level data, over the period 1985-1997, the authors investigate the NPLs determinants for savings and commercial banks in Spain, separately. They find that credit risk in both the savings and commercial banks is driven by credit growth, inefficiency, the portfolio composition (loans without collaterals/total loans to the private sector), the net interest margin, the capital ratio as well as by GDP growth. In the case of commercial banks, NPLs significantly depend on the business cycle whereas in savings banks, bank-related variables have the highest explanatory power on NPLs.

Jimenez and Saurina (2004) focus on over 3 million Spanish loans, granted during the month of December of five years: 1987, 1990, 1993, 1997 and 2000. Findings suggest that loans guaranteed by collateral are riskier due to 'moral hazard', savings banks report higher defaults on loans whereas a good bank-customer relationship leads to a higher probability of default.

Jimenez and Saurina (2006) focus on the link between GDP growth, the real interest rate and the loans' growth rate and NPLs for a panel of Spanish banks, over the 1984-2002 timeframe. In line with the theoretical considerations and the existing empirical evidence, findings suggest that NPLs

are positively related to real interest rate and the loans' growth rate whereas negatively affected by economic growth.

Akwaa-Sekyi and Gene (2016) study the effect of eight Spanish banks' internal control on their NPLs over the decade: 2004-2013. They use the Generalized Least Squares regression based on the fixed effect and random effect models to estimate credit risk behavior towards 13 variables[21] that capture internal control in banks. Findings indicate that the majority of internal control variables determine credit risk of the eight banks.

It becomes obvious from the above review that the existing studies that investigate credit risk in Spain are mainly focused on the explanatory power of a variety of bank-specific variables and only slightly consider indicators of business cycle in their credit risk models. Moreover, there are no recent studies that focus on Spanish NPLs' from the peak of the GFC (2009) and on. The most recent study by Akwaa-Sekyi and Gene (2016) estimates the explanatory power of variables from the banking-industry only, exclusively related to internal control, leaving on shade other bank-related factors (i.e. profitability ratios such as ROA and ROE) or variables from the macroeconomic or financial markets environment that may be highly related to credit risk in Spain. Given that Spanish banks are still reporting high NPLs ratios and the country has been through two major turbulences over the last decade such as the GFC and the ongoing sovereign debt crisis (since year 2010), doing further investigation that captures this critical time period and a wider range of potential explanatory variables is a necessity.

d. Turkey

In the case of Turkey, the existing empirical studies that investigate credit risk determinants of the Turkish banks are quite recent as they start in the years following the GFC. The rationale behind the delayed empirical work may be attributed to the satisfactory quality of loans granted by Turkish banks in the years succeeding the 2001 financial crisis. The burst of the GFC though, manifested in the deteriorated quality of bank loan portfolios worldwide, seems to have constituted the wakeup call for empirical work on the issue. Vatansever and Hepsen (2013) consider a wide range of explanatory variables and apply both the Engle-Granger approach and the Cointegrating Regression Durbin Watson test to investigate NPLs in Turkey, for the period 2007-2013. According to the study's findings, NPLs are immune from changes to the debt ratio, the loan to asset ratio, the confidence index-real sector, the consumer price index, Euro/ Turkish lira rate, USD/ Turkish lira rate, the money supply change, the interest rate, GDP growth, the Eurozone's GDP growth and the

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[21] These variables include: board independence, board expertise in finance, board size, management experience, loans to deposit ratio, loans to total assets, non-earning assets to total assets, audit quality, new branching, bank size, bank age, profitability intent, corporate restructuring and leverage.

volatility of the Standard & Poor's 500 stock market index. On the contrary, the industrial production index, the Istanbul Stock Exchange 100 Index and the inefficiency ratio of all banks have a negative effect on NPLs whereas the opposite significant impact on the latter is achieved by the unemployment rate, the return on equity and the capital adequacy ratio.

Yurdakul's (2014) study employs the Engle-Granger (1987) and Gregory and Hansen (1996) cointegration techniques to analyze the long-run relation between credit risk and a range of macroeconomic variables over the period 1998M1-2012M7. The author concludes on a negative link between NPLs and the Borsa Istanbul 100 index as well as GDP growth whereas the adverse impact is observed for unemployment, M2, the foreign exchange rate and the interest rate. The positive effect of the foreign exchange rate on NPLs is linked to the high share of foreign currency loans (USD and Euro) in the Turkish banking system.

Us (2017) studies the NPLs' dynamics before and after the GFC, by an ownership breakdown, for a panel of 21 banks in Turkey, over the period 2002Q4-2013Q3. The author concludes that the capital adequacy ratio, the large bank size, bank lending, inefficiency, GDP growth, inflation rate and sovereign debt impact differently NPLs before and after the crisis. Moreover, results vary according to the type of ownership, state or non-state bank.

Overall, the existing studies on credit risk determinants in Turkey have considered a variety of explanatory variables in their investigation and provide useful insights on the issue. Still, they are limited in number and lack the use of diverse/more advanced econometric techniques that would insure the reliability of results and would aid generate more accurate results. Moreover, the recent economic, social and political turbulence in the country requires identifying alternative variables that appear to be more relevant to the current tension considering that the first signs of negative effects on the Turkish loans' quality have already appeared. [22]

2.4. Conclusions

The surveyed empirical work on credit risk uncovers the diversity of findings among studies owing to different measures of asset quality used (NPLs or LLPs), type of investigation performed (group of countries or country-specific) and various methodologies employed. While reviewing the empirical evidence though, a number of gaps become evident, presented below:

a. Panel data/cross-country studies comprise the majority of the existing literature thus, the latter lacks the estimation of idiosyncratic features. Despite the fact that these studies have attempted to form homogeneous samples of countries with similar economic and financial conditions, credit risk in each one of them may be strictly linked to country-specificities

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[22] According to the CBRT (2019) Financial Stability report, the NPLs ratio increased to 5% in the third quarter of the year 2019 compared to 3% in the previous year (September 2018).

(Chaibi and Ftiti, 2015). The analysis of individual countries can better capture country-specific factors/effects which may be more relevant to NPLs than those captured in panel data studies (Jakubík and Reininger, 2013). Furthermore, as NPLs definition differs among countries, it would be highly unlikely to achieve robust results by investigating a group of countries, however similar they may appear in terms of economic and financial conditions (Glen and Mondragon-Velez, 2011). Therefore, a case by case analysis is the most accurate method of exploring credit risk.

b. The existing single country analyses are based upon a limited number of explanatory variables to investigate short timeframes, especially in the countries where this research is focused. Moreover, their findings are not cross-checked through the use of a second methodological approach, thus, may be biased by the model specification and are more likely unreliable. Therefore, the proposed study for Albania, Italy, Spain and Turkey adds to the existing empirical evidence on credit risk drivers by covering a longer post-crisis interval, focusing on idiosyncratic features of countries while collecting a comprehensive set of potential explanatory variables and applying the ARDL approach to cointegration, which as explained previously, exceeds the other methods applied in the literature contribution of the thesis, in terms of its unique features. To check the robustness of the findings, the VECM approach to cointegration is also employed and the impulse response functions are estimated.

c. The link between credit risk and the European sovereign debt crisis has received very limited attention by the previous studies devoted to the countries that are mostly sensitive to it, such as Italy and Spain. Considering that both these countries still report considerable defaults on their loans while they remain at the center of attention for their high level of indebtedness, it is necessary to account for it while investigating the factors that drive credit risk in these countries.

d. Last but not least, most of existing studies performed for Southeast European countries have not taken into account the dominance of foreign ownership in the banking systems of these countries (See page 16) and as such, any potential contagious effect from the two recent crises has remained uncovered. Albania's tight linkage of twenty years to Italy through the trade and bank channels as well as Turkey's increased foreign banking presence over the last decade, provide good material for investigating any spillover effect on the quality of their loans.

The next chapter presents an overview of the economic and financial background of the focal countries.

Chapter 3: Financial and economic conditions of Albania, Italy, Spain and Turkey

Introduction

This chapter explores how the economies and the banking systems of the focal countries have evolved over the time period investigated (1998-2016). The aim is to highlight the country-specific features that may contribute to credit risk in each country. The chapter is organized in five sections; the first four describe the key developments in the economies of Albania, Italy, Spain and Turkey along with the most important features of their banking systems prior to and following the global financial crisis. Furthermore, the evolution of each country's credit risk indicator, over the period under investigation is analysed. The last section summarizes and concludes the chapter.

3.1. Overview of the Albanian economy and banking system

Albania is a developing non-EU country in the Balkan region, whose cultural heritage and strategic geographical position in the Mediterranean Sea among crucial European countries such as Italy and Greece, could not aid its integration in the Western Europe. The main reason behind this country's delayed economic and financial progress lies in the fact that Albania suffered the harshest communist regime in Eastern Europe for almost 50 years (1944-1991).

3.1.1. Overview of the Albanian economy

Up until 1991, Albania's economy was fully centralized and private enterprise was strictly forbidden. The country was totally isolated as travelling, trade and business relations with the foreign world were prohibited and condemned by the dictatorship of Hoxha. At the collapse of the communist regime in 1991, the Albanian economy was also near-collapse and over 800,000 Albanians (almost 1/3 of the population) left the country and settled mostly in Italy and Greece. Given the extreme economic pressure and social and political unrest, several governments rose and fell until March 1992, when the Democratic Party won the elections. To ease the critical economic conditions, foreign assistance from the European Union, the IMF and the US started flowing in. Moreover, permission on private trade and foreign investment in the country were among the first measures undertaken by the new government. Specifically, these measures included the liberalization of price controls and of trade, the implementation of tight fiscal and monetary policies and, starting in July 1992, the establishment of a floating exchange rate (Bezemer, 2001). Privatization occurred largely in agriculture, transport, service and the real estate sector. Since the establishment of the two-tier banking system in 1992, the number of commercial banks expanded rapidly and they became the main suppliers of debt financing to the economy. As a result, the

economy showed signs of recovering, as an average growth rate of 6.6% was registered over the 1992–1996. However, over this period the country experienced very high inflation (averaging at 70%) and high unemployment rate averaging at 14%, which indicate that the transition faced many challenges and that the harsh economic conditions at the beginning of the transition period took their time to heal. An important role during the transformation process was played by remittances from Albanians working abroad, which during the period 1991-1996 comprised in average, 20% of the Albanian GDP. It is worth noting that the economic reforms undertaken by the Democratic government were not based on a regulatory framework for a normal function of an open market economy since the public authorities lacked the experience in that. As a result, the informal economy and the pyramid finance schemes[23] were key features in the economic and social life of Albanians at that time. The collapse of the pyramid schemes in 1997 swallowed a large share of Albanian's savings. As such, a massive rebellion of Albanian citizens demanding compensation from the Government, followed. Moreover, weeks of looting and anarchy caused huge damages to the social stability of Albania and delayed economic progress. As observed in Table 1, in the year 1997, the economy experienced negative growth of 10.8% (Jarvis, 1999) whereas the inflation rate reached 33%.

Table 1. Albania: Key economic indicators

	1997	1998-2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Population (million)	3.1	3	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
GDP growth (%)	-10.8	5.8	7.5	3.3	3.7	2.5	1.4	1	1.8	2.2	3.4
Inflation (%)	33	3.9	3.4	2.2	3.6	3.4	2	1.9	1.6	1.9	1.3
Investment (% of GDP)	20.1	33.6	33.9	32.7	28.4	29.4	26.5	26	24.1	24.4	2.5
Investment growth (%)	-20.6	20.4	5.5	1	-8.5	5.9	-7.8	-1.9	-4.5	3.5	2.4
Remittances (% of GDP)	13.3	14	14.5	14.2	13.3	12	11.5	10	10.7	11.3	11
Unemployment (%)	13.2	19.9	13	13.8	14.2	14	13.4	15.6	17.5	17.1	15.2
Public debt (% of GDP)	81.9	61.1	55.1	59.7	57.7	59.4	62.1	70.4	72	73.3	72

Source: World Bank

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[23] During 1996-97, several pyramid firms attracted the finances of many Albanian citizens. Some disappeared as fast as they were created whereas others continued their activity until the collapse of the entire pyramid system.

As the turmoil in Albania attracted global attention, several foreign companies left the country at the fear of not being able to operate safely and the overall investments fell by 20.6% compared to the previous year (See Table 1). The unrest would last longer and the consequences would be harsher hadn't it been for the intervention of the United Nations peacekeeping troops that managed to gradually restore public order. The Socialist party won the elections whereas the new appointed government focused on implementing rapid strong measures to revive the weakened economic activity and trade.

As a result of the reforms, the economy started breathing again and an average growth rate of 5.8% was recorded for the period 1998 – 2007. Investments (mainly in the industrial and construction sector) increased substantially over the period 1998-2007, from 20.1% of GDP in the year 1997 to an average of 33.6% over the decade. Exports of textile, fabrics and oil to the European Union countries (mostly to Italy and Greece) increased substantially compared to the previous years whereas the inflation rate starting floating at normal rates averaging at 3.9% during the decade. The average unemployment rate though, was considerably high (19.9%). Remittances continued to play an important role, averaging at 14% of GDP over the period 1998-2007. It is worth noting that the privatization process in the banking system, which was previously entirely state-owned, played an important role in supporting economic growth and aiding businesses in their activity. It all started with the privatization of the oldest commercial bank in Albania (BKT), towards the end of 2000, an event that brought new experience and knowledge in the field of banking, and thus, a new era started in the Albanian financial and economic system. As shown in Table 1, Albania was one of the few countries of Europe that recorded positive growth rates during the GFC (7.5% in 2008), however, the negative impact of the successive euro area's debt crisis could not be avoided since Italy and Greece were at the center of the crisis, and thus, exports and in particular remittances suffered accordingly. Growth rates fell to 3.3%, 3.7% and 2.5% in the years 2009, 2010, 2011 respectively and continued the downward trend until 2014, when slow recovery started. Despite a considerable improvement in the year 2008, when the unemployment rate fell to 13%, the successive years were associated with an upward trend on unemployment that reached 15.6%, 17.5% and 17.1% in the years 2013, 2014 and 2015 respectively. In parallel with the deterioration in the other key economic indicators, investments, mainly in the construction sector, also fell in the crisis aftermath due to an overall decreased demand for real estate, credit crunch and the inability to collect funds for projects that had already been started. However, according to the World Bank (2017) outlook, Albania's economy grew to 3.4% in 2016, driven mainly by two large FDI-financed energy projects and a recovery in private consumption. According to the World Bank (2019) Economic Outlook for Albania, growth further sped up to 4.8% in the year 2018 whereas

unemployment rate fell to 11.9% in the beginning of 2019. Still, tensions in the international markets may bring trouble to the Albanian economy. Lower demand from foreign trade partners could potentially reduce Albania's exports and FDI inflows, constrain growth, worsen labor market conditions and increase poverty, with implications for a slower output growth.

3.1.2 The Albanian banking system

During the communist regime, the Albanian banking system was entirely state-owned (Dushku, 2010). The structural reforms undertaken after the regime's collapse (1992-1996), aimed at establishing a two-tier banking system as well as focusing on other critical matters such as lowering and monitoring inflation and minimizing budget deficit (Bezemer, 2001).

The new Banking Law introduced in 1992 approved the existence of a two- tier banking system comprised by four banks only: Albanian Trade Bank, Savings Bank, Banka Kombëtare Tregtare (BKT) and Rural & Development Bank (Meka and Kadareja, 2012). There was a high concentration in the Albanian banking system at that time: all household deposits were transferred to one bank (Savings Bank) that providing more than 75% of the whole banking system services, whereas the second largest bank (BKT) was left with business & enterprise bank accounts (Meka and Kadareja, 2012). During that time, Albania entered the IMF and World Bank programs, thus, technical and monetary assistance was achieved. The requirements for banks established in Albania were quite strict though. Moreover, the restrictive monetary and fiscal policies undertaken by the Bank of Albania contracted lending to the economy and also constrained the establishment of officially recognized banks, whose primary role was undertaken by the informal financial sector (Bezemer, 2001).

The social unrest created by the collapse of the pyramid schemes in 1997, associated with the rapid devaluation of the domestic currency (Albanian Lek) brought difficulties to the well-functioning of the banking system. Lending and loans' quality were particularly harmed with NPLs comprising more than half of the total loans in the banks' balance sheet in the end of year 1998 (Figure 1). The consecutive years were characterized by rapid structural and technical developments in the Albanian banking system. The entrance of foreign financial institutions, mainly Greek and Italian ones, expanded the number of banks operating in Albania to eight. Advanced experience was injected, mainly in the field of lending and as such the latter increased rapidly by meeting the needs of both households and businesses. Moreover, the largest domestic banks were privatized, starting with BKT in the end of year 2000 and followed by the largest bank in Albania, Savings Bank, in the year 2004. Consequently, the government's presence in the Albanian banking sector came to an end (Meka & Kadareja, 2012).

Figure 1. Albania: NPLs/ Total loans (%); 1998Q4-2016Q1
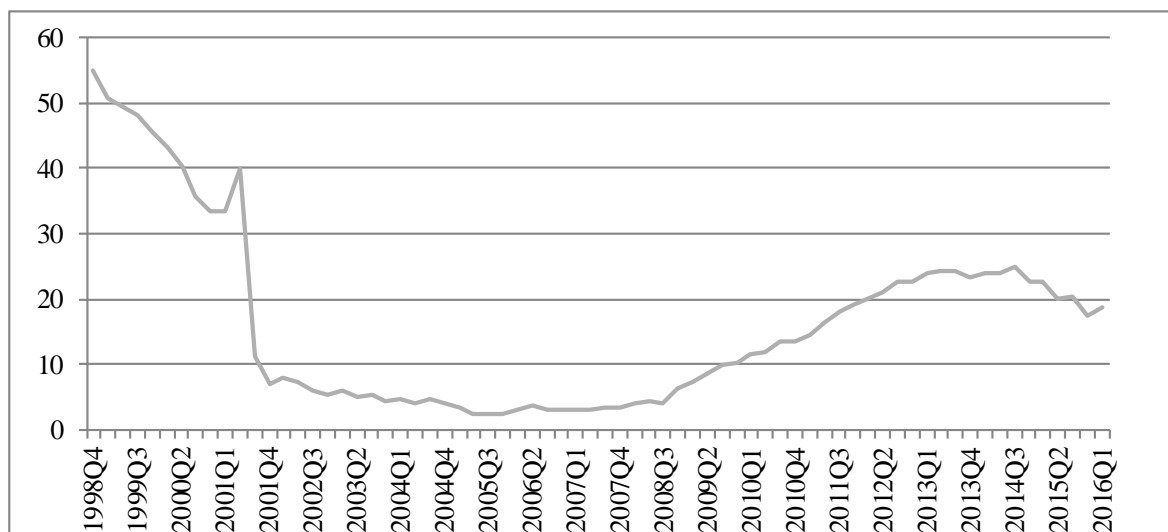
Source: Bank of Albania

As observed in Figure 1, the NPLs ratio started the descent in the year 2001 and reached 11% in the third quarter of the year 2001 compared to 34% in the beginning of the same year. The loans' performance continued to be satisfactory up to the beginning of the GFC, with NPLs ratio ranging between 4%, 3% and 6% in the end of years 2004, 2006 and 2008 (See Figure 1). The consecutive years recorded higher NPLs ratios which peaked to 25% in the third quarter of the year 2014 and continued to be high, with a value of 19% in the beginning of the year 2016. It could be assumed that such a dramatic increase in NPLs was due to excessive lending, mostly in the real estate sector, during the blooming years of the Albanian economy and banking system. Moreover, it is believed that the GFC affected the Albanian financial system in terms of reduced GDP growth, remittances, exports and internal consumption (Shingjergji, 2013b). However, the fact that the quality of loans continued to worsen in the consecutive years and NPLs still remain high, leaves a huge gap in such a discussion.

Currently, there are twelve banks operating in Albania, out of which only four have Albanian shareholding majorities. As observed in Figure 2, foreign owned banks account for 84% of the assets size of the Albanian banking system.

Figure 2. Albania: Structure of ownership: Asset size (%) (as of end of 2018)
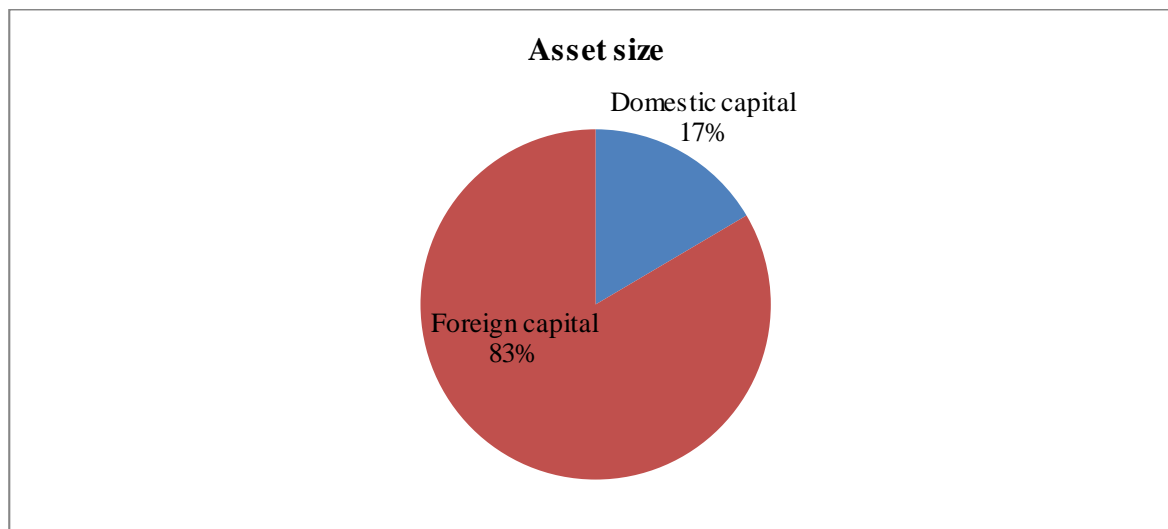
Source: Bank of Albania

The significant foreign capital presence in the Albanian banking system and in particular, the fact that the Greek and the Italian capital comprise 24% of the capital structure (See Figure 3), ring a bell on whether the sovereign debt crisis that has negatively affected the economies of the two neighbor countries, is also a potential cause of bad loans in Albania.

Figure 3. Albania: Capital ownership structure by country of origin (%) (as of end of 2018)
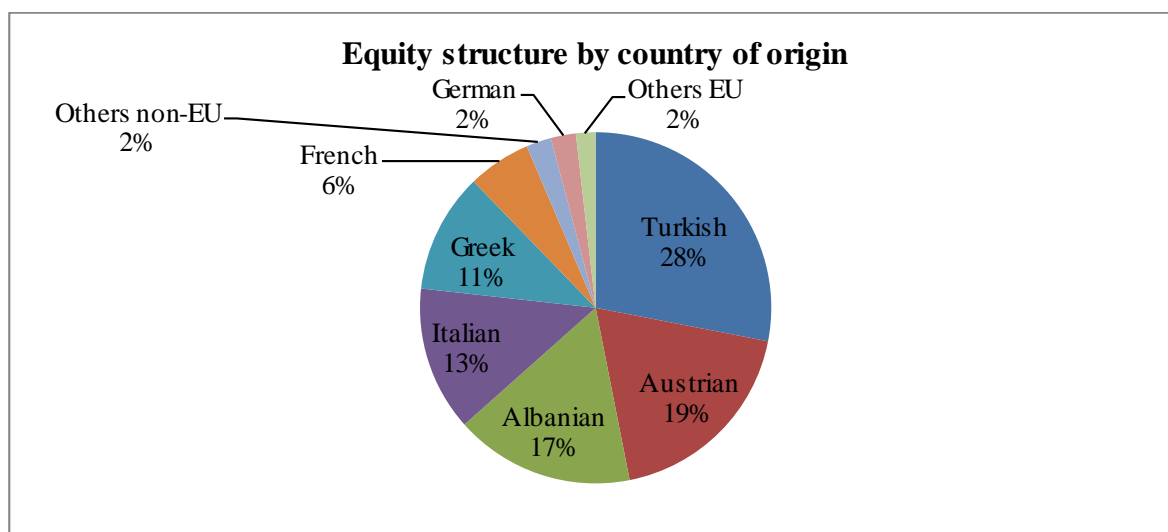
Source: Bank of Albania

3.2. Overview of the Italian economy and banking system

Located in the Mediterranean Sea, the magnificient country of Italy has always played a critical role for Europe. Not only is acknowledged as the birthplace of the Western civilization (along with

Greece) but it has also been among the first six countries that established the European Economic Community in 1958.

3.2.1. Overview of the Italian economy

Unlike other Southern European countries, Italy is known for its historical economic stability. Since the World War I, Italy started being recognized as a prosperous economy in Europe, whose modernization over the successive years (1950s and 1960s) ranked it among the industrial leaders of Europe, a critical role that Italy continues to hold up to nowadays (Colli, 2014).

Business, agriculture and luxury automobile are the key sectors along with textiles, fashion and tourism. Industrial production was mainly provided by capital- and technology-intensive industries of the Second Industrial Revolution (such as chemicals, pharmaceuticals, energy, steel, and heavy mechanics) (Colli, 2014). It is worth noting that, industrial areas were mainly located in the wealthier northwest part of the country whereas the remaining territory was less modernized and more focused on tourism and agriculture.

However, as Europe and the whole world entered the era of financial innovations and technological advancement (during the 1980s), Italy's industrial companies found it difficult to compete with the biggest players in the global markets. The small size of the Italian firms, many of which are family owned, was the key factor that prevented the traditional manufactoring industries from innovation and competitive advantage (Bank of Italy, 2006). Moreover, issues that have been left unsolved by successive governments regarding inefficiencies in the public sector and the taxation system, became a permanent obstacle for the Italian firms to adapt to advancements in the global technology (IMF, 2019b). The competitive power of the Italian firms was also considerably harmed by the emerging economies which by offering the same category of products at lower prices, contributed to a loss of market share for the Italian exports. This was the moment when public debt started to become a legacy for the Italian economy. An expansionary fiscal policy, financed through debt, kept growing up, and as such, underlying problems like slowing growth and innovation were hidden well. Up to the year 1994, gross debt rose by more than 60 %, which is twice as much as after 2007 during the time of the heaviest recession since World War II (Ehmer, 2018).

According to the Bank of Italy (2011) Economic Outlook report, Italy's public debt has been the main reason behind Italy's weakened positions in the wake of the GFC. Indeed, Italy is the second country in Europe (after Greece) with the highest public debt to GDP ratio which reached 132% in the year 2016 compared to an average of 83% ratio of the European Union (IMF, 2019b).

As observed in Table 2, Italy's economy was on a moderate growth (averaging at 1.6% over the period 1997-2007), associated by low average inflation (3%) and unemployment rate (9.3%) in the years preceding the GFC. Its public debt though, was already high averaging at 104.6% of GDP in the decade preceding the GFC. As the latter occurred, the Italian economy also took part in the suffering.

Table 2. Key economic indicators

	1998-2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Population (million)	57.3	58.8	59	59.3	59.4	59.5	60.2	60.8	60.7	60.6
GDP growth (%)	1.6	-1.1	-5.5	1.7	0.6	-2.8	-1.7	0.1	1	0.9
Inflation (%)	3.3	3.3	0.8	1.5	2.8	3.0	1.2	0.2	0	-0.1
Investment (% of GDP)	20.5	21.2	20	19.9	19.6	18.3	17.2	16.7	16.9	17.1
Investment growth (%)	2.9	-3.1	-9.9	-0.5	-1.9	-9.3	-6.6	-2.3	2.1	3.2
Unemployment (%)	9.3	6.7	7.7	8.4	8.4	10.6	12.1	12.7	11.9	11.7
Public debt (% of GDP)	104.6	102.4	112.5	115.4	116.5	123.3	129	131.8	131.5	132

Source: World Bank

The unemployment rate increased in the aftermath of the GFC and still remains above 10% with 40% of the youth unemployed. Wage growth outpaced productivity growth, contributing to high structural unemployment (IMF, 2019b). In response to the uncertainty about the consolidation of growth, spending on capital goods reduced gradually from 21.2% of GDP in the year 2008 to 16.7% in the year 2014, followed by a slight increase in the years 2015 and 2016 (16.9% and 17.1% respectively). As is the case during crisis, investments in construction, especially residential buildings, were considerably reduced both during and in the GFC aftermath. GDP growth shrank to -1.1% and -5.5% in the years 2008 and 2009 respectively and despite a slight recovery in the years 2010 and 2011 (1.7% and 0.6%), it switched to negative digits in the consecutive years coinciding with the peak of the European debt crisis (See Table 2). Due to the latter, a second recession started in Italy in the third quarter of 2011 (Bonaccorsi di Patti et al., 2015). The country was seriously affected, from the summer of 2011 on, by investors' concerns over the sustainability of the public finances in the euro area because of its high public debt and the economic slowdown (Bank of Italy, 2013). For this purpose, Italy is currently categorized as a peripheral country of Europe along with Greece, Ireland, Portugal and Spain and constitutes the Achilles heel of the European Union future.

According to IMF (2019b), the country's public debt remains the biggest concern not only for Italy but for the entire global economy since any downgrade to junk status of an important sovereign issuer may cause turmoil in the global markets (IMF, 2019b). Most likely, the sovereign debt crisis will rapidly spread not only among other members of the euro era due to their high indebtedness and strong economic ties with Italy but also among the less leveraged countries of Central and Eastern Europe (such as Albania) where Italian subsidiaries own a good market share (IMF, 2019b).

3.2.2 The Italian banking system

Banks stand at the core of Italy's financial system given the small size of firms that have always counted on bank credit for financing. Moreover, given that most of the players in the industry are family owned/controlled, there has been a hesitation of allowing outside shareholders into the business thus, banks have been the preferred source of financing instead of the financial markets (De Bonis et al., 2012). Banks' central role to the Italian economy became highly apparent in the end of the 19th century At that time, the United Kingdom had built up a significant competitive advantage in the financial sector thus, core EU countries such as France, Germany and Italy were not ready to rely on the financial markets to fund economic growth (De Bonis et al., 2012). Since then, Italy's financial market remained underdeveloped whereas the banking system grew rapidly.

Up until the year 1990, the Italian banking system was dominated by local oligopolies. Since 1990 though, its structure changed owing to two main factors: the liberalization of branching and the increase in mergers and acquisitions (De Bonis et al., 2012). Banks' privatization 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. Thus, prior to the GFC, the Italian banking system was swimming in an expansionary cycle characterized by rapid growth in bank lending and increased competition and efficiency among banks.

As observed in Figure 4, the rate of new bad loans[24] in the beginning of the investigated period was quite high, reaching 0.77% in the end of year 1998 and 0.67% in the end of year 1999. According to the Bank of Italy (1999) Annual report, it was required from the banks to reduce their exposures to not more than 40% of their supervisory capital, by end of December 1998. Hence, the reduction in loan exposures was associated with a decrease in the ratio of new bad debts in the beginning of year 2000, to 0.35% (See Figure 4).

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[24] "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, p. 12).

Figure 4. Italy: New bad debts / the stock of loans at the end of the previous quarter (%); 1998Q1-2016Q1.
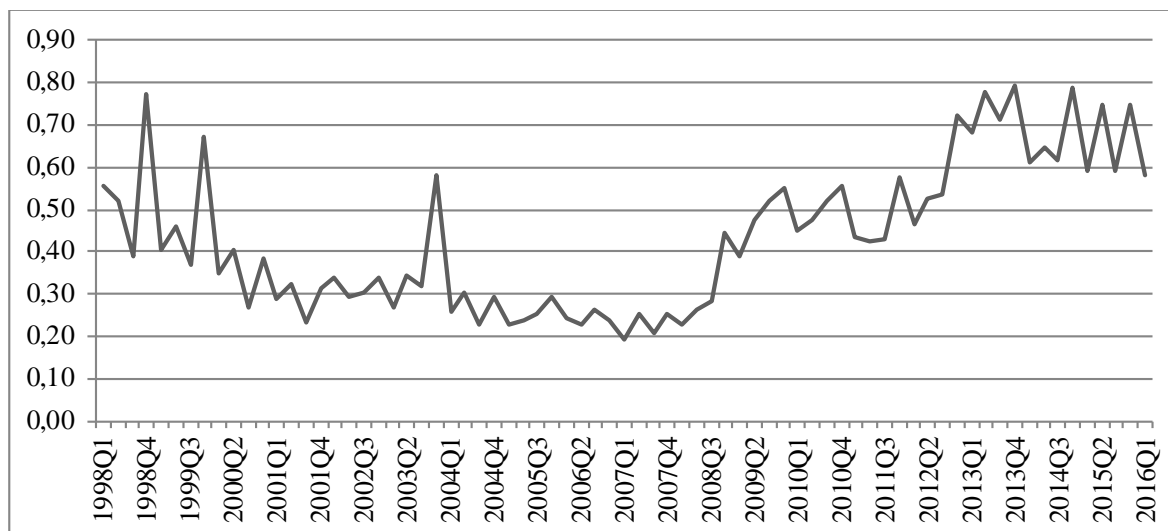
Source: Bank of Italy

During the period 2000- 2008, the rate of new bad loans 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 (Albertazzi et al., 2013). 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 0.74%.

Notwithstanding with the above, Italy did not suffer directly from the consequences of the 2008 financial crisis and its banking system successfully withstood the impact of the crisis as apparently, Italy's weakness derives from the public sector rather than from its adequate banking system (Albertazzi et al., 2013).

According to the Bank of Italy (2019) Annual report, there were 505 banks operating in Italy as at the end of year 2018, divided into public limited banks, mutual banks, cooperative banks and branches of foreign banks. Domestic banks dominate the sector, accounting for 92% of its total assets (See Figure 5).

Figure 5. Italy: Structure of ownership: Asset size (%) (as of end of 2018)
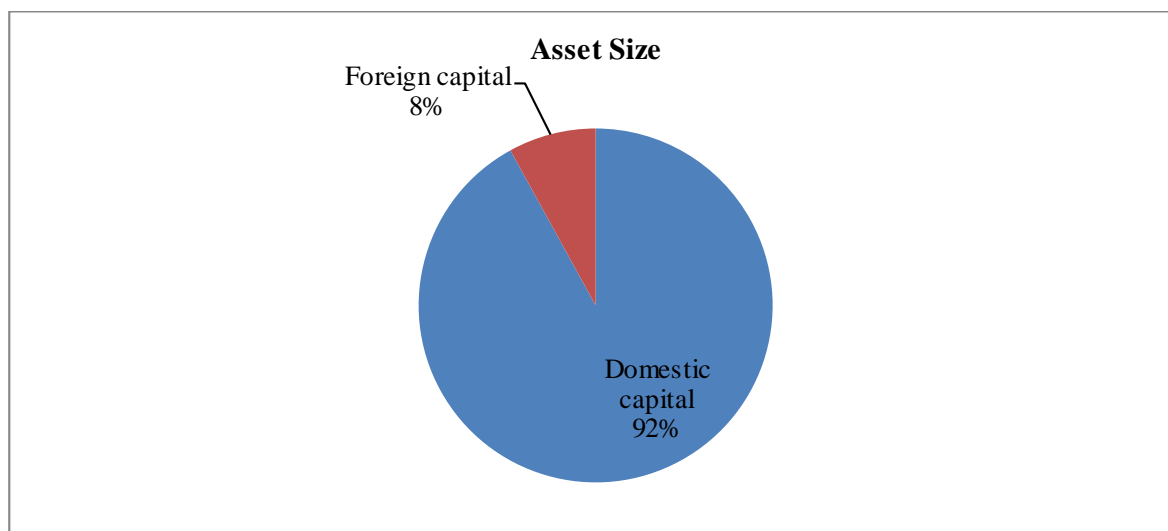
Source: Bank of Italy

According to the Bank of Italy (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 Bank of Italy (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. Indeed, according to the Bank of Italy (2018) Annual Report, in the beginning of 2019 the sovereign risk premium exceeded its value of one year ago since the outlook of the Italian economy in the eyes of the global investors remains uncertain.

3.3. Overview of the Spanish economy and banking system

Located in southwestern Europe, Spain is a core EU country that joined the EU in 1986. Prior to that, the country had suffered complete isolation from the outside world under the dictatorship of General Franco, for a period of 36 years (1939-1975) (Gila-Gourgoura and Nikolaidou, 2017).

3.3.1 Overview of the Spanish economy

Spain started to be involved in the European integration in the beginning of the 1980s, following 36 years of dictatorship. At the fall of the latter, lowering the high unemployment rate of 18% to single digits was among the key reformative steps taken by the new government. Recovering was achieved during the mid-1990s whereas a decade of sound growth initiated for Spain in the late 1990s, fueled mainly by an increased domestic demand for housing and massive flows of foreign investment (Carballo-Cruz, 2011).

As reported in Table 3, while investments grew on average by 6.7% over the period 1998-2007 and while the average inflation rate dropped to 2.9%, average unemployment of the period (12.6%) exceeded that reported by other core EU countries (Gila-Gourgoura and Nikolaidou, 2017).

Table 3. Spain: Key economic indicators

	1998-2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Population	42	45.9	46.4	46.6	46.7	46.7	46.6	46.5	46.4	46.5
GDP growth (%)	3.9	1.10	-3.6	0.0	-1	-3	-1.7	1.40	3.4	3.3
Inflation (%)	2.9	4.1	-0.3	1.8	3.2	2.4	1.4	-0.1	-0.5	-0.2
Investment (% of GDP)	13.4	29.2	24.3	23	21.5	19.8	18.7	19.3	19.8	20
Investment growth (%)	6.7	-3.9	-16.9	-4.9	-6.9	-8.6	-3.4	4.7	6.5	3.3
Unemployment (%)	12.6	11.2	17.9	19.9	21.4	24.8	26.1	24.4	22.1	19.6
Public debt (% of GDP)	51	39.4	52.7	60.1	70	85.4	93.7	99.3	99.3	99

Source: World Bank

According to Neal and Garcia-Iglesias (2012), although there was an improvement in employment in Spain, prior to the GFC, labor productivity was lower compared to similar countries (such as Greece and Italy) and to the average of the Eurozone. The main reason behind low productivity lied in the high concentration of the working force in the non-tradable sectors of the Spanish economy such as services and construction (Neal and Garcia-Iglesias, 2012). Moreover, most of the investments were concentrated in these areas only, leaving underdeveloped other important sectors of the economy (i.e. clothing) that could classify Spain as an affirmed competitor internationally. Indeed, the construction sector was a significant contributor to Spain's GDP since the country experienced the highest property boom in Europe, during the period 2000-2009. Despite the temporary glowing economy though, according to Carballo-Cruz (2011), counting on domestic

demand only and more specifically on the construction and housing sector to achieve healthy growth was wrong. Instead, serious economic imbalances were created since the strong domestic demand led to an increased indebtedness of the private sector that transmitted the tension to the banks (National Bank of Belgium, 2012). At the burst of the real estate bubble, consequences have been dramatic both for the economy and the main source of its financing: the banking system.

Given that the burst of the Spanish real estate bubble in the year 2008 coincided with the onset of the GFC, the consequences for the Spanish economy were devastating. Specifically, high unemployment rates of 17.9%, 19.9% and 21.4% were recorded in Spain in the years 2009, 2010 and 2011 respectively, since jobs in the real estate sector disappeared as quickly as they were created. As growth contracted to -3.6% in 2009 (See Table 3), the Spanish banking system was reporting a great number of defaults on loans granted for housing or other construction purposes, Spain received a bail-out package of Euro 100 billion in June 2012, following Ireland, Greece and Portugal. As a result, Spain's indebtedness expanded abnormally up to the end of year 2014 when it almost equaled the value of its GDP (Gila-Gourgoura and Nikolaidou, 2017).

According to the Bank of Spain (2015) stability report, a positive growth rate of the economic activity (1.4%) initiated in Spain since the year 2014, after tough austerity measures and major reforms. An intensive job-creation activity, as part of the reforms, contributed to a slight decrease in unemployment. However, Spain's youth unemployment rate, the large share of temporary contracts and the involuntary part-time employment remain among the highest in the European Union (IMF, 2018). On the other hand, enhanced competitiveness and the internationalization of firms have boosted exports, which in turn have fuelled the strength of investment, employment and, through this latter variable, of consumption too. Currently, clothing, communications and energy are the key industries driving the Spanish economy. The latter has improved in structure as a result of domestic reforms (Bank of Spain, 2015). However, as long as the public debt of Spain remains still high compared to that of other core Euro zone nations, the risk of another recession is at the doors. Specifically, the Spanish public debt is still close to 100% of GDP—nearly three times as high as it was at the onset of the GFC (IMF, 2018). The high indebtedness will make it difficult for Spain's economy to endure future shocks; in that case, measures such as cuts in spending and increase of taxes will have to be undertaken and thus, will be associated by unpleasant consequences for the Spanish population.

3.3.2 The Spanish banking system

During the dictatorship of Franco, the activity of the Spanish banking sector was in the hands of seven large privately owned banks (Dymski, 2013). The oligopolistic nature of the Spanish banking

system remained unchanged as democracy was established in the country, despite the fact that deregulation incentives were undertaken by the government to boost competition and lower costs for new entries (Deeg and Perez, 2000). Hence, instead of increasing competition, deregulation led to a systemic crisis[25]. A decade later, the increased presence of foreign banks in the Spanish banking system would have managed to accelerate competition if it wasn't for the wave of mergers and acquisitions among the domestic banks that expanded their share in the total banking system's assets and strengthened their position in the market (Dymski, 2013). Specifically, the big seven commercial banks of the Franco's era, reduced their number to three large banks[26] and a smaller one, thus, the banking sector became highly consolidated and very oligopolistic. During the 1990s, Spanish banks were categorized according to the types of loans they were offering: commercial banks got specialized in commercial and industrial loans, savings banks in mortgage loans whereas cooperatives in loans to small businesses and individuals located in local areas (Dymski, 2013). Notably, commercial banks were the largest as they served large firms, followed by savings banks that were focused on local markets in specific large cities whereas credit cooperatives were the smallest as they served smaller cities and communities. Thus, certain linkages that existed back at the time of Franco's dictatorship, such as the exclusive partnership between large banks and large corporations, remained unchanged also in the new era (Dymski, 2013).

Despite the Spanish banks' focus on distinctive customer categories in order to provide more specialized services, their weight in the economy of Spain was rather low. According to the study by Murinde et al. (2004), during 1972-1996, Spain was among the EU member countries that were not converging towards a bank-oriented system since non-financial corporations were not relying on bank debt for financing new investments but rather on equity finance. Hence, banks were not the main source of financing the economy over the period 1972-1996.

Things changed though, in the successive years up to the onset of the GFC, since during this time, the economy heavily relied on construction. These years were characterized by an aggressive demand for housing, associated with a rise of 115% in the average housing price in Spain between 1997 and 2007, compared to a 40% average in the Eurozone (Carballo-Cruz, 2011). The fact that banks were the major contributors of the funds injected in the housing sector and the construction industry, made them highly vulnerable to tensions in the latter. Indeed, problems for banks started when real-estate prices fell rapidly in the year 2008 and mortgage borrowers were left with homes worth less than their outstanding loans whereas construction companies could not sell apartments at the projected prices, prior to the crash.

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[25] In the 1978-83 period, 52 out of 110 total institutions, representing a fifth of all bank deposits, experienced solvency problems: 24 were rescued, 4 liquidated, 4 merged, and 20 small and medium-size banks nationalized (Dymski, 2013, p.5).

Moreover, the outbreak of the two consecutive crises: the GFC (in 2008) and the European debt crisis (in April 2010), considerably worsened the quality of loans granted by the Spanish banks; default rate for credit to real estate developers reached 14%, for credit to construction companies 11% whereas the default rate for housing loans was below 2.5% (Dymski, 2013).[27]

The evolution of Spanish NPLs over the period 1998Q1–2016Q1 is presented in Figure 6. Despite the descending trend at the beginning of the period, the Bank of Spain (2002) financial stability report highlighted a slight increase on the Spanish NPLs in the year 2002. However, as observed in the graph below, it was the outbreak of the GFC that fueled the sharp increase of NPLs in the beginning of 2008 thus. More precisely, the ratio jumped from 0.8% in the fourth quarter of 2007 to 4.3% in the end of year 2009.

Figure 6. Spain: NPLs/Total loans (%); 1998Q4-2016Q1
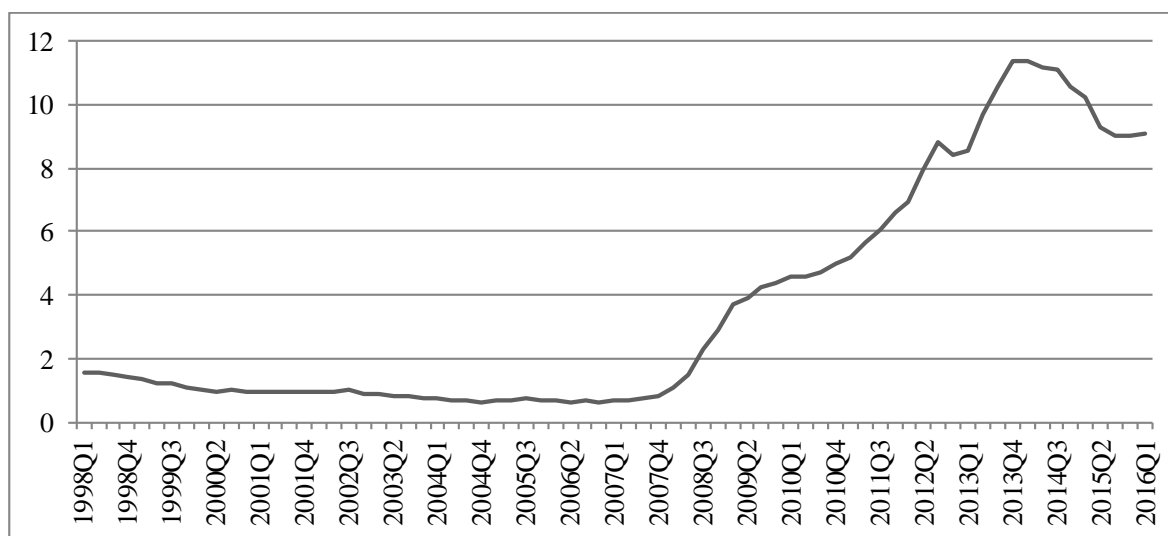
Source: Bank of Spain

Notably, at the dawn of the European sovereign debt crisis the loans' quality further deteriorated, reaching 8.4% and 11.3% in the end of years 2012 and 2013 respectively. As previously mentioned, Spain received a bailout package in 2012, which among others included capital injections in the Spanish banks, as part of their recovery plan. As a result, the NPLs ratio started descending in the upcoming years and reached below 10% in December 2015, from 10.6% in the same month of the previous year. However, the risk of potential loss or decrease in investor confidence regarding the country's capacity to carry out the adjustments still outstanding and undertake further structural improvement, may put at risk the financial stability of Spain's economy.

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[27] Under Spanish law, repayment obligations remain for loans to individuals, even when the assets purchased with those loans have been vacated (Carballo-Cruz, 2011).

According to the Bank of Spain (2019) Supervisory report, there are currently 197 banks operating in Spain, consisting in 133 commercial banks 61 credit cooperatives and 2 savings banks, most of which are domestically owned (See Figure 7).

Figure 7. Spain: Structure of ownership: Asset size (%) (as of end of 2018)
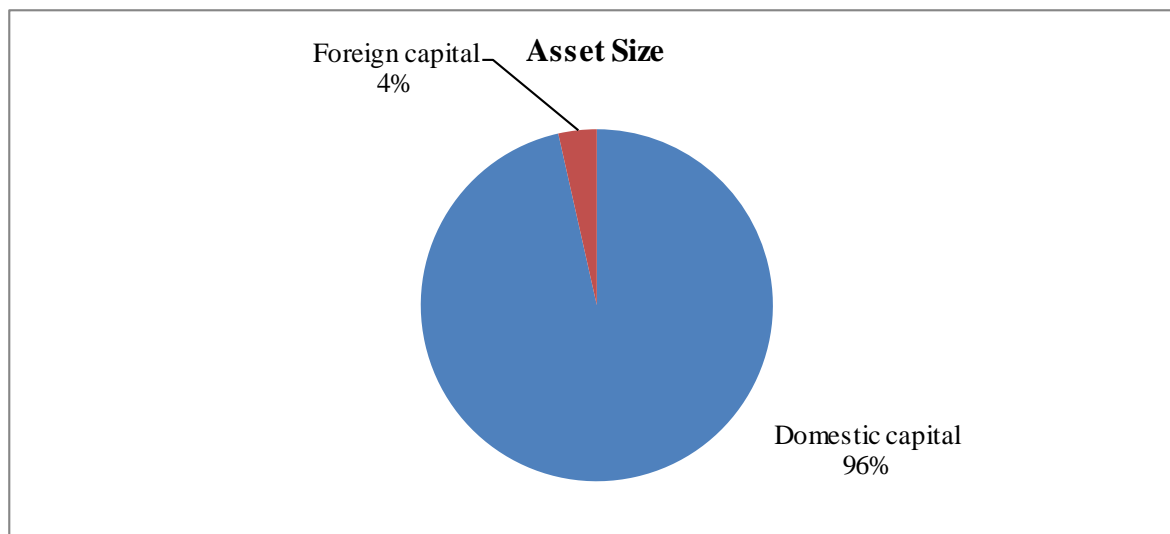
Source: Bank of Spain

3.4. Overview of the Turkish economy and banking system

Turkey is a bridge country connecting Western Asia with Europe, considering that it lies partly in both the continents (mainly in Asia). It is classified as an emerging economy and at the same time constitutes one of the leading economies of the world, with the 17th largest nominal GDP.

3.4.1. Overview of the Turkish economy

Turkey is among the world's top producers of textiles, agricultural products, construction materials and electronic appliances. Since becoming a member of the World Trade Organization (WTO) in 1995 and joining the Customs Union with the European Union in 1996, Turkey's exports increased substantially mainly in high-technology sectors. More precisely, vehicles, textiles, gold and jewelry comprise Turkey's major exports to Germany, Switzerland, Italy and the US.

Turkish economy began to integrate in the global markets in the 1980s and became heavily dependent on foreign capital inflows. In August 1989, the decision to establish full capital account liberalization made Turkey an open market (Keyman and Koyuncu, 2005). Had the liberalization occurred in a solid regulatory environment though, associated by good governance in the public and private sectors, the upcoming turmoil of the year 2001 could have been avoided (Macovei, 2009). The decade 1989-1999 was characterized by boom bust cycles in the economy, with growth rates ranging between 9.3% in 1990, -4.6% in 1994 and 7.5% in 1997. Most of the economic activity was

operated by inefficient state enterprises whose scarce production could not sustain a steady growth. Moreover, the inefficient fiscal policy that led to high inflation and a weakened domestic currency (Turkish lira) had considerably harmed macroeconomic stability (Macovei, 2009).

At the beginning of the year 2001, one of the most severe crises in the history of Turkish economy burst out, similar to those occurred in other countries at those times, such as the Asian crisis in 1996 and the Argentinian crisis in 2000. As observed in Table 4, Turkey's economy experience negative growth of 6% in 2001, investments fell from 22% of GDP in 2000 (World Bank) to 18% in 2001 whereas the unemployment rate jumped to 19% from 13% in the year 2000. According to Ozatay and Sak (2002) and Keyman and Koyuncu (2005), the lack of sound supervision and fiscal discipline in the Turkish financial liberalization of the 1980s that left Turkish financial system defenseless in the global markets as well as the existing structural problems of the economy were the main reasons behind the crisis' outbreak. As the government allowed the lira to float freely in the beginning of the year 2001, the domestic currency depreciated around 40% against the dollar (Macovei, 2009). Consequently, Turkish consumers were faced with a severe inflation rate which reached 54.4% in the year 2001 (See Table 4). Moreover, public debt dramatically increased to 77.9% of GDP in 2001 from 38.2% in the year 2000 (World Bank). As the Turkish financial system was exposed too fast to the global technological advances, Turkish banks had not gained yet the expertise to handle speculative incentives (Keyman and Koyuncu, 2005). Therefore, their high exposure to various risks combined with structural weaknesses failed in preparing the ground for a sound public debt financing (Macovei, 2009).

It was the IMF's intervention in 2001 that restored confidence in the Turkish economy by providing more funds to stabilize the exchange rate and to bring down interest rates (Keyman and Koyuncu, 2005). Following the year 2002, Turkey welcomed foreign investments whereas fundamental reforms were undertaken in the existing regulatory framework in order to provide the needed ground for efficient foreign trade (World Bank, 2019). The economy recovered gradually with growth rates varying between 6.4% in 2002, 9% in 2004 and 5% in 2007 (World Bank), fueled mostly by the private consumption and expanded investments, which grew on average by 15% during the period 2002-2007 (Macovei, 2009). In parallel with the restored growth, the inflation rate started to drop and from an average rate of 40.5% over the period 1998-2007, reached 10.4% in the year 2008 and managed to maintain single digits in the consecutive years (See Table 4).

Table 4. Turkey: Key economic indicators

	'98-2007	2001	2008	2009	2010	2011	2012	2013	2014	2015	2016
Population	65	64.2	70.4	71.3	72.3	73.4	74.6	75.8	77	78.3	79.5
GDP growth (%)	4.5	-6	0.8	-4.7	8.5	11.1	4.8	8.5	5.2	6.1	3.2
Inflation (%)	40.5	54.4	10.4	6.2	8.6	6.5	8.9	7.5	8.8	7.7	7.8
Investment (% of GDP)	23.6	18	26.8	22.4	24.9	28	27.3	28.5	28.9	29.7	29.3
Investment growth (%)	9	-27	-2.7	-20.5	22.5	23.8	2.7	13.8	5.1	9.3	2.2
Unemployment (%)	8.7	19	9.7	12.5	10.7	8.8	8.1	8.7	9.9	10.2	10.8
Public debt (% of GDP)	53.7	77.9	40	46	42.3	39.1	36.1	36.1	33.5	32.9	33

Source: World Bank

As shown in Table 4, the GFC was associated with a contraction of 4.7% in the Turkish economy in 2009, mainly due to a decline in exports destined to the European countries facing recession at that time. Moreover, investments fell by 2.7% and 20.5% in the years 2008 and 2009 respectively, whereas unemployment jumped to 9.7% and 12.5% in 2008 and 2009. However, Turkey recovered rather quickly from the negative effects of the crisis as a geographical re-orientation of exports to countries less affected by it such as African countries and the Middle East, provided quick relief from the shock (Macovei, 2009). Besides, Turkish economy was sustained by a resilient banking sector that was not severely affected by the GFC as a result of comprehensive reforms adopted in the wake of the 2001 crisis (Gunes and Yildirim, 2016). To this extent, growth rates of 8.5%, 11.1%, 4.8% and 8.5% were recorded in the years 2010, 2011, 2012 and 2013 respectively (See Table 4), associated by a fall in the unemployment rates to 10.7%, 8.8%, 8.1% and 8.7% in the same years.

In 2015 though, a massive wave of over 3 million Syrian refugees entered Turkey, an event accompanied by social unrest, political instability and economic turbulence for the hosting country. Furthermore, a series of terrorist attacks discouraged tourism and foreign investments, leading to a lower economic growth of 3.2% in the year 2016 (See Table 4). The attempted coup in July 2016, followed by public officials' dismissals, negatively affected the Government reform momentum in Turkey. Moreover, it considerably harmed investors' confidence in Turkey's economic and political health, a fact that was manifested in the substantial depreciation of the Turkish Lira in the successive years. Indeed, growth slowed down to 2.7% in 2018 due to the intense turbulence caused by the dramatic devaluation of Turkish Lira by 25% (World Bank, 2019). Turkish consumers and

businesses got severely hit by skyrocketing food prices since the plummeting Lira sent inflation to its highest pace in 15 years, more precisely, to 20% in the beginning of the year 2019. However, the Central Bank of the Republic of Turkey (CBRT) (2019) Stability report claims that Turkey remains competitive in international trade thanks to the supporting effect of the cumulative depreciation in Turkish lira and companies' flexibility in diversifying their export markets. Besides, the accumulated effects of exchange rates decreased and the sky-high inflation rate finally came down to 8.5% in October 2019 and rose slightly more than expected in the end of December 2019 as a result of the monetary policy stance based on interest rate cuts.

3.4.2. The Turkish banking system

Banking sector has a major share in the developed financial system of Turkey. Prior to the 2001 crisis, the Turkish banking system was dominated by four state-owned banks which held 30% of its total assets. Being forced (by the policies in force) to provide subsidized credit to the agricultural sector and to craftsmen, they had accumulated a large amount of losses. The remaining fifty banks were relatively small, privately-owned and insolvent. In August 2000, the Banking Regulation and Supervision Agency (BRSA) was established as a regulatory authority. BRSA became exclusively in charge of banks' regulation and supervision, missions that were previously fulfilled by the Treasury and the Central Bank (The Banks Association of Turkey, 2009). However, it penetrated quite late in the activity of the already fragile Turkish banking system; its critical role on the stability of the Turkish banking system would become more evident in the aftermath of the 2001 crisis.

At that time, both state banks and private banks were operating under minimal risk-aversion, each type due to different reasons. State banks were exposed to interest rate risk as their financing was limited to just short-term domestic instruments whereas private banks were highly sensitive to variations in the foreign exchange rate given their preference of borrowing in foreign currency while investing in government bonds (denominated in Turkish lira) (Macovei, 2009). Under these circumstances, their prudential indicators had deteriorated to the point that made an upcoming crisis highly unavoidable.

Indeed, as the macroeconomic imbalances emerged, the NPLs[28] ratio reached 11% and 19% in the years 1999 and 2001 respectively (See Figure 8). For reasons explained above, as the Turkish lira depreciated in February 2001, private banks reported huge losses due to their un-hedged foreign

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[28] Banking regulations in Turkey require banks to provision for past-due loans for the equivalent of 25% of the outstanding past-due amount every 6 months. Whenever a loan delay occurs, regulators require a 30 day period to initiate administrative procedures and another 30 day period for legal procedures. After 60 days the loan is considered non-performing (IMF, 2000).

currency position (BRSA, 2009). The intervention of the government in June 2001, to switch the private banks' investments from Turkish lira government bonds to USD-denominated bonds, aided banks to cover their negative foreign exchange positions. Gradually, the banking system entered its stability path.

Figure 8. Turkey: NPLs/total loans (%); 1998Q1-2016Q4.
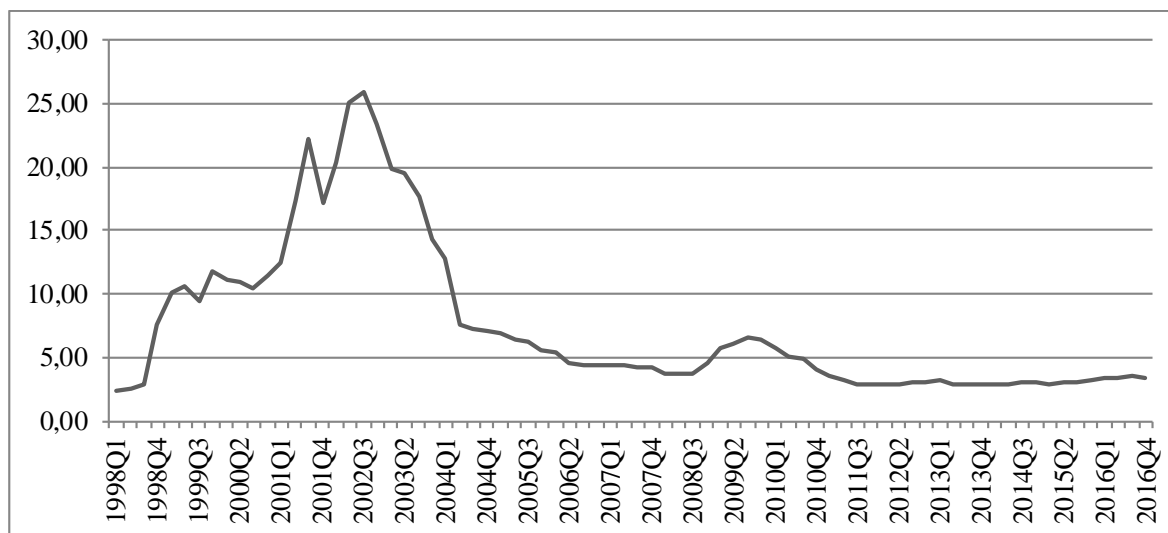
Source: CBRT

BRSA undertook the following crucial steps as part of the "Banking Restructuring Program": i) transferring funds to banks facing financial problems through the Savings Deposit Insurance Fund, ii) restructuring state-owned banks that were reporting high default rates on loans granted to Treasury and whose resources were used inefficiently due to political interventions and iii) implementing a program for the reinforcement of the equity capital of private banks whose asset quality worsened and equity capital declined, with the condition that a three-party audit should be made prior to granting any financial support (The Banks Association of Turkey, 2009).

Therefore, as shown in Figure 8, the NPLs ratio continued its skyrocket values up to the year 2002. Since then, the quality of loans in the Turkish banking system has been quite satisfactory. There was a slight increase in bad loans during the GFC and the NPLs ratio peaked to 6.56% in the third quarter of the year 2009. Still, it started to fall in the year 2010 and since then has not exceeded the value of 4%. According to Ersoy and Cagil (2017), the Turkish banking sector took lessons from the 2001 crisis and undertook the correct restructuring process afterwards, considering that it was less affected from the recent GFC, than other developed markets. The impact of the global crisis was rather limited due to the strength of the banking sector after restructuring in Turkey (Ersoy and Cagil, 2017). In the years following the big crisis, Turkey managed to achieve single digits interest rates instead of the extremely high (double digits) rates of the previous years

(CBRT, 2014). As of today, there are three state-owned Turkish banks which together with the nine largest private owned banks, hold two thirds of the total banks' assets. As observed in Figure 9, foreign banks accounted for 24% of the total assets of the Turkish banking system in the end of year 2018. There is a variety of foreign banks' branches and foreign subsidiaries in the Turkish banking system with capital originating from: the US, United Kingdom, Russia, France, Italy, Spain, Pakistan and Iran.

Figure 9. Turkey: Structure of ownership: Asset size (%) (as of end of 2018)
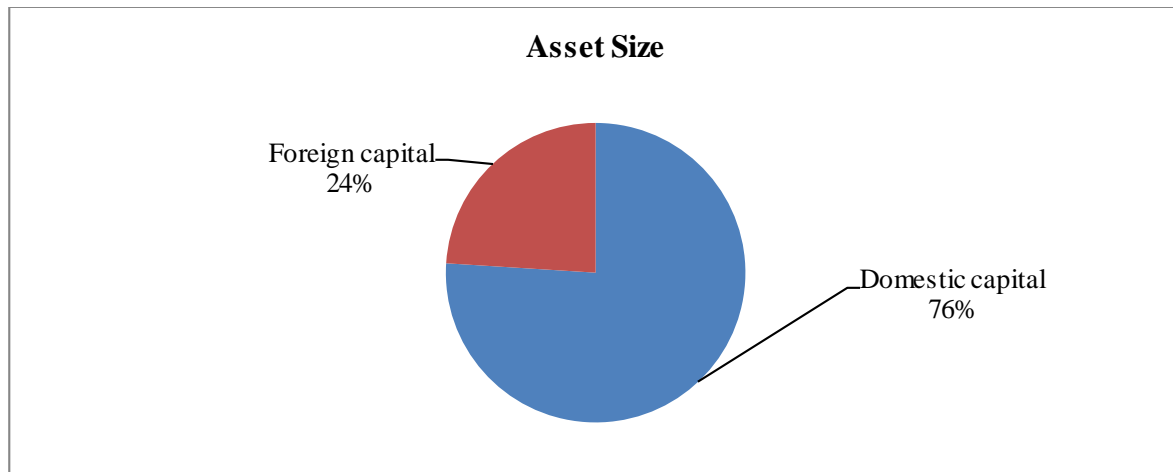
Source: The Banks Association of Turkey

It is worth noting though, that despite the good performance that the Turkish banking system manifested in the post 2001 crisis era (including the GFC and the debt crisis aftermath), the recent political, social and economic disturbances in the country, have managed to provide a suitable environment for credit default. According to the CBRT (2019) Financial Stability report, the NPLs ratio increased to 5% in the third quarter of the year 2019 compared to 3% in the previous year (September 2018). Most of this upward trend in NPLs was driven by corporate loans rather than by retail ones, considering that the Lira devaluation made it extremely challenging for companies to service their foreign currency loans.

3.5 Conclusions

The current turbulence in Europe, fueled by the GFC and strengthened by the sovereign debt crisis, highlighted the flaws in the economic and financial systems of several European countries. Albania, Italy, Spain and Turkey are four European countries, which despite the attributed similarities are currently dealing with distinctive drawbacks that require special attention by policymakers.

As a result of deregulation, globalization and technological advancements, the focal countries experienced growth and a rapid bank lending expansion over the decade preceding the GFC. Italy

and Spain were enjoying the halcyon days of the booming period as core EU countries whereas Albania and Turkey went through several financial ups and downs while trying to meet the criteria mandatory for them to join the EU. At the onset of the GFC though, recession followed and particularly in Albania, Italy and Spain, the quality of bank loans deteriorated. The Turkish banking system managed to maintain a decent quality of its loans owing to the lessons learnt by a previous financial crisis occurred in 2001. Whilst Italy and Spain are currently downgraded to peripheral countries of Europe due to their high indebtedness and the ongoing economic recessions, Albania's banking system still lacks the necessary reforms considering that NPLs ratio exceeds its level registered in the aftermath of the GFC. On the other hand, Turkey's ongoing currency meltdown may inflict significant damages among the European banks given their prominent position as debt holders of the Turkish private debt.

To summarize, the chapter has discussed the major features of the Albanian, Italian, Spanish and Turkish economies and banking systems over the investigated timeframe (1998-2016) while trying to unfold idiosyncratic characteristics that matter to credit risk in each focal country. The overview of the four countries' economies and banking systems as well as the existing linkages between them has revealed country-specific features that can be incorporated in the empirical analysis. The next chapter introduces the dataset of each focal country as well as the methodology followed for this purpose.

Chapter 4: Data and Methodology

Introduction

This chapter displays the dataset and the methodology followed to investigate the determinants of credit risk in Albania, Italy, Spain and Turkey. For this purpose, a comprehensive set of variables is used, based upon the existing theoretical and empirical literature as well as by taking into consideration the specific features of each country, which are believed to affect credit quality. The selected credit risk proxies for each country along with the wide range of explanatory variables are thoroughly outlined and explained in Section 4.1. Two distinctive econometric techniques are applied: the ARDL approach to cointegration advanced by Pesaran and Smith (1998), Pesaran and Shin (1999) and Pesaran et al. (2001) and the Johansen (1988) and the Johansen and Juselius (1990) cointegration approach (the VECM framework). The empirical work is finalized by estimating the impulse response functions (which became popular after the study by Sims, 1980). The rationale of using the particular techniques, the steps through which they are conducted and the advantages/limitations of each approach, are clearly explained in Section 4.2. The chapter concludes with Section 4.3.

4.1. Data and limitations

The discussion of the theoretical and empirical literature in Chapter 2, unfolded the main variables that are believed to affect credit risk whereas the review of the economic and financial conditions of the focal countries in Chapter 3, provided clues on the idiosyncratic factors for each country that may particularly be useful to our empirical investigation. Taking stock from both, this study uses quarterly data over the period 1998Q1-2016Q1, for a wide range of explanatory variables and a selected proxy of credit risk for the banking systems of Albania, Italy, Spain and Turkey. The investigated timeframe covers the stable economic period (1998-2007), the big crush (2008-2009), the European debt crisis (2010-2012) as well as an extended post-crises time interval (2013-2016) compared to that analyzed in the previous studies.

The relevant studies on credit risk have commonly used two distinctive variables as credit risk proxies: the ratios of NPLs or LLPs to total loans. Between the two, the NPLs ratio (defined in Chapter 2) is considered to be superior to the LLPs ratio not only because data on this indicator is easily obtained but also because it represents a reliable measure of credit risk that typically increases before and during banking crises (Demirguc-Kunt and Detragiache, 1998; Quagliariello, 2004). On the other hand, LLPs are backward-looking, as during economic booms, banks

intentionally forget about the risk of incurring losses because of disaster myopia[29], because of herding behavior or because high provisioning is perceived by shareholders as a sign that the quality of the loans' portfolio is not satisfactory (Quagliariello, 2004). Moreover, as the management may 'play' with LLPs in the interest of income-smoothing strategies, their values will not truly refer to credit risk (Foglia, 2008). One should note however, that the choice of a credit risk proxy depends largely upon the availability and the reliability of data.

Prior to introducing the credit risk indicator/proxy for each country along with the wide range of its determinants as suggested in the literature and according to the specificities of each country, it is worth noting that, our investigation is restricted by data limitations such as the lack of quarterly data on the non-performing loans ratio prior to 2008, in the case of Italy. Whilst the NPLs ratio is the selected proxy of credit risk in Albania, Spain and Turkey, in the case of Italy, the probability on loans' default is measured by the ratio of the flow of new bad loans to the outstanding amount of performing loans in the previous quarter. This ratio is also used as credit risk indicator in previous studies performed for Italy (Quagliariello, 2004; Marcucci and Quagliariello, 2008; Bofondi and Ropele, 2011). As Marcucci and Quagliariello claim *"Bad loans are a good ex-post indicator of the riskiness of banks' debtors"* (Marcucci and Quagliariello, 2008, p. 8). In the case of Italy, the ratio of the flow of new bad loans is considered a more precise proxy for credit risk than the NPLs ratio since the NPLs stock can be misleading because of write-offs and securitization (Marcucci and Quagliariello, 2008). Besides, Italy's long judicial procedures for credit recovery actions force banks to report high NPL ratios and thus, provide confusing results (Bank of Italy, 2013).

Another limitation worth noting concerns the period under investigation, which although for all the focal countries covers three distinctive time intervals: pre-crises, crises and post-crises, in the case of Albania, the time frame lacks three quarters, compared to the other countries' investigated period. Specifically, in the case of Albania the investigation period spans from the fourth quarter of the year 1998 to the first quarter of the year 2016 whereas for Italy, Spain and Turkey it covers the period: 1998Q1-2016Q1. Obviously, the lack of data in the case of Albania is strictly related to the critical economic, financial and political conditions in the country during the year 1997 as a result of the pyramids scheme collapse.

Moreover, there are some concerns regarding the quality of data for Albania and Turkey as is usually the issue when it comes to developing countries. More precisely, data for these two countries may be unreliable and present inconsistencies due to lack of experience in maintaining accurate information (in the case of Albania) or certain crises that their economies/financial systems

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[29] *"Disaster myopia is a systematic tendency to underestimate shock probabilities"* Guttentag and Herring, 1986, p.2). Such behavior increases a firm's exposure to shocks and decreases its ability to resist them.

have gone through and have caused interruptions/inaccuracy in time-series data maintenance (in the cases of both Albania and Turkey).

Having discussed the data limitations of this study, the next step consists of presenting the datasets of the four countries.

4.1.1. The dataset for Albania

Albania's dataset is comprised of quarterly estimations that span from the last quarter of the year 1998 to the first quarter of 2016. Data is collected from the Bank of Albania's official website and from the European Central Bank (ECB). A summary of all the variables is outlined in Table A1 in the Appendix A.

The NPLs ratio is the measure of credit risk in the Albanian banking system. According to the Bank of Albania regulation, NPLs include three categories of loans: sub-standard, doubtful and loss (See Table 5 below).

Table 5. NPLs definition in the Albanian banking system

NPLs	
Sub-standard	i. Borrowers' financial condition, capital and inflows are assessed as insufficient for the regular meeting of the default liabilities, or the bank does not have the completed, required or updated information, needed to fully assess his financial situation. ii. The principal or interest is not paid for a period from 91-180 days from the date of installment payments.
Doubtful	i. Borrowers' financial condition, capital and inflows are assessed as insufficient to fully meet the liabilities, the borrower manifests liquidity related problems, and the declaration of borrower as insolvent/bankrupted is valued as a real possibility. ii. The principal or interest is not paid for a period from 191-365 days from the date of installment payments.
Loss	i. The financial situation of the borrower is clearly assessed to not succeed in fully meeting the terms on the payment of principal and interest; or it is assessed that there is a lack of all the needed documentation to determine the financial situation; or the borrower is insolvent/bankrupted, is involved in a liquidation process; or the borrower is dead and none can pay the loan; or the bank has deposited at the judicial officer the demand on the beginning of the mandatory execution of collateral, if the loan is secured by collateral. ii. The principal or interest is not paid for a period more than 365 days from the date of installment payments.

Source: Bank of Albania

The Albanian dataset consists of a variety of potential explanatory variables; the macroeconomic indicators selected in the investigation are: the unemployment rate, the trade balance captured by

the exports and imports, the current account, the gross external debt and the monetary aggregates (M1, M2 and M3). Based on the relevant theoretical considerations and empirical evidence on the macroeconomic determinants of credit risk, a high unemployment rate will be associated to more problematic loans whereas all the other variables are expected to be negatively related to NPLs (Nkusu, 2011; Messai and Jouini, 2013; Chaibi and Ftiti, 2015).

Along with the macroeconomic variables, financial markets' indicators are included in the dataset of Albania although the latter is not directly exposed to the developed stock exchange markets. The 3-month Euribor rate is included in the investigation considering that foreign currency loans, mainly in Euro, comprise a substantial part of Albanian banks' loan portfolios since the start of the economic boom. According to the Bank of Albania (2016) Stability report, the foreign currency loan category accounted for 60% of the total outstanding loans as of end of June 2015. Despite the fact that this category of loans is granted in both Euro and US dollars, those in Euro comprise the biggest share, given the strong trade ties between Albania and the European Union[30] (Shingjergji, 2016b). Specifically, the 3-month Euribor rate is expected to worsen the quality of loans granted in Euro and therefore increase NPLs.

Other financial markets' indicators also included in the dataset of Albania are the Brent oil price and the Chicago Board Options Exchange (CBOE) Market Volatility Index: VIX. Oil price is expected to positively impact bad loans in Albania since higher oil prices are usually associated by higher inflation, reduced growth (by making oil import more expensive) and increased uncertainty about the future. VIX, which indicates the markets' fear about the future, is also expected to have a positive effect on NPLs (Klein, 2013).

One of the novelties of this study, compared to the previous ones performed for Albania, is the introduction of two indicators which are not directly related to Albania: the proxy of the Italian sovereign debt crisis risk and the slope of the yield curve for Italy.

The proxy of the Italian sovereign debt crisis risk is calculated as the spread between the yield on the 10-year Italian government bond and the corresponding German one (the BTP-Bund spread) whereas the slope of the yield curve for Italy is calculated as the difference between the 10-year Italian government bond yield and the 3-month Euribor and proxies the outlook for economic growth in Italy (Albertazzi et al., 2013).

The main reason for including these variables in the study is that Italy is the major trading partner of Albania, since it is the destination of more than half of the Albanian exports, as reported in Table 6. Regardless of the incurred economic and financial disturbances, Italy remained the main

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[30] According to the Intesa Sanpaolo Bank Albania (2018) Annual report, Albania's main trade partners are: Italy, Spain, Germany and Greece. The major part of exports consists of textile and footwear, minerals, fuel and energy as well as construction materials whereas imports include minerals, fuel and energy.

destination of Albania's exports as of end of December 2018, with a share of 43% (Intesa Sanpaolo Bank Albania (ISPA), 2018).

Table 6. Italy's stake in the Albanian foreign trade: 2004-2015

Year	2004-2007	2008	2009	2010	2011	2012	2013	2014	2015
% of Exports	70	62	61	51	53	51	46	52	51
% of Imports	29	26	26	28	31	32	32	31	30

Source: Bank of Albania, ISPA

Furthermore, Italy and Greece host respectively 40% and 37% of the Albanian immigrants[31] whose remittances are an important contributor to Albania's economy.

Table 7 displays the remittances' contribution to Albania's GDP over the time frame investigated in this research. It is observed that in the aftermath of the GFC remittances started to decline and reached the lowest value in the years coinciding with the burst of the debt crisis (2011-2015). Unfortunately quarterly data on remittances are not available.

Table 7. Personal remittances received (% of GDP): 1998-2015

Year	1998-2007	2008	2009	2010	2011	2012	2013	2014	2015
% of GDP	16	14	14	13	12	11	10	10	11

Source: World Bank

Last but not least, the Italian bank that operates in Albania (ISPA), accounts for 13% of the total assets of the Albanian banking system, the third largest share after Turkey and Austria[32] (Intesa Sanpaolo Bank Albania, 2018). To this extent, the Albanian banking sector is considerably exposed to potential contagion from its neighbor.

To summarize, Italy's contribution to the economic and financial activity of Albania is significant. Therefore, it is assumed that the proxy of the Italian sovereign debt crisis (the spread between the yield on the 10-year Italian government bond and the corresponding German one) is positively associated to NPLs in Albania. Moreover, a negative outlook for economic growth in Italy indicated by an increase in the slope of the yield curve (the difference between the 10-year Italian Government bond and the 3-month Euribor) may negatively impact credit risk in Albania.

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[31] Greece used to be country with the highest number of Albanian migrants, until 2010. As it was highly hit by the GFC and the sovereign debt crisis, a part of these migrants returned to Albania or migrated to other destinations. Currently, the majority of Albanian migrants lives in Italy (Bank of Albania).

[32] 28.38% of system assets originate from Turkey, 15.11% from Austria and 13.04% from Italy (Intesa Sanpaolo Bank Albania, 2018).

Variables from the Albanian banking industry, included in the Albanian dataset are: total credit, the Albanian banks' profitability ratios such as the return on assets (ROA) and the return on equity (ROE), total real estate loans, the real estate loans ratio to total loans, bank concentration, loans to deposits ratio, loans to assets ratio as well as the capital to assets ratio. Total credit is among the widely used explanatory variables by the existing empirical literature, whose impact on credit risk is expected to be positive since excessive lending is usually associated to a higher probability of bad loans (Keeton, 1999; Salas and Saurina 2002).

Apart from total credit, real estate loans and they portion to total loans are considered potential credit risk determinants in this research, with a potential positive effect on NPLs. The underlying reason is the relevance of the construction sector to the Albanian economy[33] and the high risk associated to construction lending since typical challenges related to construction projects such as costs overrun and delays in projects delivery, may end up in project's failure (Vasilescu et al., 2009).

As far as ROA and ROE are concerned, in accordance with the theoretical considerations mentioned in Chapter 2 (bad management and procyclical credit policy hypothesis), their potential effect on Albanian NPLs is ambiguous (Louzis et al., 2012; Beck et al., 2013).

Bank concentration was extremely high at the start of the two-tier banking system in Albania in 1992 (above 80%) whereas over the last decade more players have entered the market and the concentration has not exceeded 55%. Bank concentration is expected to positively impact NPLs since a high banking sector concentration means a deeper financial system and therefore a greater likelihood of excessive lending by banks (Babihuga, 2007).

Lastly, the loans to deposits ratio and the capital to assets ratio are two bank-specific indicators included in the Albanian dataset that proxy bank liquidity and risk undertaking scale. Whilst the loans to deposits ratio is believed to have a positive impact on bad loans due to a higher risk associated to excessive lending, the effect of the capital to assets ratio is ambiguous and therefore it can be either negative (for low capitalized banks that engage largely in risky activities) or positive (for well capitalized banks that engage in few but very high-risk activities) (Fiordelisi et al., 2011; Castro, 2013; Makri et al., 2014).

4.1.2 The dataset for Italy

In the case of Italy, the dataset spans from the first quarter of the year 1998 to the first quarter of the year 2016. Data is collected from the Bank of Italy's official website, the IMF and the ECB. A

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[33] The construction sector is among the three biggest contributors to the Albanian GDP, along with agriculture and textile.

detailed description of all the variables is given in Table A2 in the Appendix A. The formal classification of NPLs by the Italian banks includes four categories (See Table 8 below).

Table 8. NPLs definition in the Italian banking system

NPLs	
Past-due	Exposures (other then those classified as substandard, restructured or bad) whose repayment has been delayed by the borrower for more than 90 days on a continuous basis.
Substandard	i. Loans which are objectively 'substandard' such as loans and credit lines which are pas due or overdrawn. ii. Loans classified by the lender as 'substandard' according to a judgmental basis only, meaning without any formal loan repayment delays to the bank in question or overdrawing on existing credit lines. This judgment could also depend upon a delay in payments to other lenders.
Restructured	Exposures in which lenders, as a result of the deterioration of the borrower's financial situation, agree to change the original conditions, giving rise to a loss for the creditor.
Bad	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.

Source: Schiantarelli et al. (2016)

As mentioned earlier in this chapter, in the case of Italy, the study focuses on the category of bad loans and uses the ratio of the (adjusted)[34] flow of new bad loans to total loans as a proxy of credit risk in the Italian banking system.

As in the case of Albania, the dataset of Italy is composed of variables that belong to three environments: macroeconomic, financial and banking-industry environment. The macroeconomic variables included in the investigation are: the current account, the CPI, the trade balance, the gross external debt, the public debt, the industrial production index, the construction activity index, the real GDP (and its components) and the monetary aggregates (M1, M2 and M3) as well as the unemployment rate. The Italian credit risk is expected to be negatively impacted by the above variables with the exception of the unemployment rate and public debt that comprise the deepest weaknesses of the Italian economy over the last decade and therefore are expected to aid excessive risk accumulation. While the positive effect of the unemployment rate is commonly supported by the relevant literature (Messai and Jouini, 2013; Beck et al., 2013), the effect of public debt on

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[34] "The definition 'adjusted' is provided by the Italian Central Credit Register to avoid any bias caused by the discretion of banks in judging the borrowers as insolvent. In the case of a single bank relationship, this definition coincides with that of bad loans, covering all the loans extended to the insolvent borrowers. Loans to borrowers with multiple bank relationships are all classified as (adjusted) bad loans when: (i) the borrower is reported as insolvent by a bank that accounts for 70 per cent or more of the borrower's exposure to the banking system; (ii) the borrower is reported as insolvent by two or more banks that account for at least 10 per cent of its total exposure to the banking system" (Bofondi and Ropele, 2011, p.10).

credit risk appears to be ambiguous. Although it represents a macroeconomic indicator whose increase means additional funds provided to the government to increase public spending and accelerate growth, if this is excessive or unwise, it may be associated to a rise in interest rates and therefore higher probability of default on loans. Italy's current public debt ratio (140% of GDP), represents the 2nd- largest public debt among the Eurozone countries (after Greece) and it is the underlying reason of Italy's involvement in the sovereign debt crisis in the years 2011-2012. Thus, it is assumed that a high public debt ratio is associated to a higher ratio of new bad loans in Italy.

The financial markets' indicators included in the Italian dataset are: the 3-month Euribor, the Brent oil price, the Italian stock market index (FTSEMIB), the CBOE market volatility index (VIX), the 10-year government bond yield, the proxy of the Italian sovereign debt crisis risk and the slope of the yield curve for Italy.

A hike in interest rates makes it difficult for borrowers to honor their debts and is therefore associated to a decrease in loans' quality (Espinosa and Prasad, 2010; Nkusu, 2011). Hence, the 3-month Euribor rate is expected to have a positive effect on bad loans.

A higher oil price is expected to positively impact the flow of new bad loans in Italy by depressing the economy and by becoming more expensive/less affordable for borrowers.

The index of the Italian stock market (FTSEMIB) is expected to negatively impact the flow of bad loans. According to Beck et al. (2013), well-performing stock-markets are negatively related to credit risk in countries with advanced financial systems. In contrast, the CBOE market volatility index (VIX) is expected to have a positive effect on the flow of new bad loans (Klein, 2013).

As previously mentioned, Italy's high government debt was the main reason why at the burst of the sovereign debt crisis, Italian sovereign yields rose sharply[35] whereas its sovereign rating declined. Albertazzi et al. (2013) argue that sovereign tensions weaken the economy thus, are transmitted also to the banking sector that starts reporting a higher rate of default on its loans. The spillover effect may be stronger in the case of Italy given that a considerable share of government bonds are held by Italian banks. Indeed, Reinhart and Rogoff (2010) argue that there is a close relationship between banking crises and sovereign debt crises. In countries where banks are significantly exposed to government debt securities (as is the case of Italy) the risk of government's default would cause severe losses on banks' balance-sheets. Moreover, both the crises (banking and debt crises) are so closely related to each other that they can even occur simultaneously (Reinhart and Rogoff, 2010). Albertazzi et al. (2013) have provided evidence that the sovereign debt spread calculated as the difference between the 10-year Italian government bond yield and the corresponding German one (the BTP-Bund spread) affects credit risk indicators in Italy,

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[35] According to ECB statistics, the yield on the 10-year Italian sovereign bond increased from 4.8% in the beginning of the year 2011 to 6.8% in the end.

specifically, the loan-loss provisions. Given this, the Italian 10-year government bond yield and the spread between the latter and the corresponding German 10-year government bond yield are considered important indicators of the Italian debt crisis risk in this research and are expected to positively affect the flow of new bad loans in Italy. Moreover, the difference between the 10-year Italian government bond yield and the 3-month Euribor rate (the slope of the yield curve) is included in the dataset as an indicator of the markets' outlook for economic growth in Italy. The higher the positive outlook for growth, the lower will be the flow of new bad debts in Italy.

Lastly, the set of bank-specific variables that are considered potential drivers of new bad loans in Italy are: total credit, capital to assets ratio, loans to deposits ratio, loans to assets ratio, the interest rates on loans to households and on loans to non-financial corporations and the interest rate on deposits. In agreement with the majority of studies that have investigated credit risk determinants, excessive credit and higher loans to assets and loans to deposits ratios are expected to have a positive effect on the new bad loans in Italy, given the risk associated to unrestrained debt (Keeton, 1999; Salas and Saurina, 2002; Ali and Daly, 2010; Festic et al., 2011: Castro, 2013). Similarly, both interest rates on loans (to households and non-financial companies) are expected to be positively associated to bad loans (Espinosa and Prasad, 2010; Nkusu, 2011) whereas the opposite effect is expected for the interest on deposits. As previously mentioned for the case of Albania, the effect of the capital to assets ratio to new bad debts in Italy can be either negative (moral hazard hypothesis) or positive due to higher risk appetite of banks that maintain good levels of capital (Fiordelisi et al., 2011; Castro, 2013; Makri et al., 2014).

4.1.3. The dataset for Spain

Similarly to Italy, Spain's dataset consists of quarterly observations that span from the first quarter of 1998 to the first quarter of 2016, displayed in Table A3 in Appendix A. Data is collected from the Bank of Spain's official website and the ECB.

Credit risk is measured by the ratio of NPLs (doubtful loans) to total loans, whose specification is presented in Table 9.

Table 9. NPLs definition in the Spanish banking system

NPLs	
Doubtful loans	Due to customers' arrears: exposure with arrears of more than 90 days on payments of interest or capital or on which arrears of +/- 90 days exceed 25% of the outstanding loan (unless already written off).
	For reasons other than customer arrears: exposure which, while not falling into the above category or that of written-off loans above, presents reasonable doubt as to respect for the terms of the loan contract (deterioration of the borrower's solvency). Loans falling into the previous category but not reaching the 25% threshold.

Source: Bank of Spain

In the same line with Albania and Italy, Spain's dataset consists of macroeconomic variables, financial markets' indicators and bank-specific features. Among the macroeconomic variables with a potential negative effect on NPLs, this research considers the real GDP, the gross fixed capital formation, total consumption, the monetary aggregates (M1, M2 and M3) that proxy money supply, the trade balance, the consumer price index, the foreign direct investment stock and the current account. On the other hand, the General Government debt and the unemployment rate are expected to positively affect NPLs. As in the case of Italy, the effect of the General Government debt on NPLs in Spain, is expected to be positive given its rapid rise in the aftermath of the GFC from 40% of GDP in the year 2008 to 98% as of end of year 2018.

Interest rates, such as the 3-month Euribor and the real effective exchange rate (REER) with reference to the 27 EU members, are included in the dataset as financial markets' indicators that have a potential positive effect on credit risk. An appreciating real effective exchange rate would make the domestic goods and services more expensive and therefore the competitiveness of the country would be puzzled (Jakubik, 2007; Marcucci and Quagliariello, 2008).

The Brent oil price, the housing index in Spain and VIX are additional financial markets' indicators included in the Spanish dataset. While VIX and the oil price are expected to positively affect NPLs, the housing index is considered a potential negative influencer of credit risk. Higher property prices make it easy for borrower to service their loans due to positive wealth effects. As prices fall though, the outstanding balance on their housing loan exceeds their home's current market value, a situation in which borrowers' ability and willingness to repay the loan diminishes (Havrylchyk, 2010). Just like the U.S., Spain experienced a property bubble[36] on the years

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[36] According to the Bank of Spain statistics, the housing index in Spain increased from 850 euro/sqm in the year 2002 to 1600 euro/sqm in the end of year 2004, to a peak of 2100 euro/sqm in the beginning of the year 2008, followed by a downward trend that recorded a value of 1460 euro/sqm in the end of year 2015.

preceding the GFC and at the burst of the latter, the dramatic downturn on property prices negatively affected the demand for housing and triggered financial instability, materialized in the increased stock of NPLs.

As in the case of Italy, three financial markets' indicators that are related to Spain's public debt are included in the investigation. Specifically, the Spanish 10-year government bond yield, the Spanish sovereign debt risk spread measured by the difference between the Spanish 10-year government bond yield and the German one as well as the slope of the yield curve calculated as the difference between the 10-year Spanish government bond yield and the 3-month Euribor rate. As previously outlined in Chapters 1 and 3, Spain was among the peripheral countries of Europe (along with Greece, Ireland, Italy and Portugal) that were involved in the sovereign debt crisis due to their high levels of public debt. The rapid increase of the latter, following the GFC, was associated with a raised concern on the Spain's creditworthiness, reflected on the rising Spanish long-term government bond yield[37] and its spread to the German one. Given this, their effect on the Spanish NPLs is expected to be positive whereas the opposite can be assumed for the effect of the slope of the yield curve.

Among the bank-specific variables included in the dataset, total credit is expected to be highly positively related to credit risk in Spain, given that the housing bubble on the first decade of this century was considerably sustained by excessive lending under relaxed borrowing criteria and very low interest rates (Akin et al., 2014). Apart from total credit, also the ratio of loans granted for house purchase and renovation to total loans as well as the ratio of loans to the construction sector to total loans are included in the dataset, to measure the effect of the Spanish banks' portfolio composition on credit risk. Both categories are associated to a higher risk of default compared to other types of loans, in particular, loans to the construction sector, which are considered the riskier ones (Salas and Saurina, 2002). Therefore, their effect on credit risk is expected to be positive.

Apart from lending-related indicators, liquidity measures such as the loans to assets ratio and the loans to deposits ratio are considered potential credit risk drivers in Spain, whose effect is expected to be positive according to the relevant literature (Festic et al., 2011). ROA, ROE and the capital to assets ratio are the final bank-specific indicators of the dataset. Taking stock from the relevant literature (Salas and Saurina, 2002; Fiordelisi et al., 2011; Castro, 2013; Beck et al., 2013; Makri et al., 2014), their effect on NPLs is ambiguous.is not clearly determined and therefore is expected to be either positive or negative on the Spanish NPLs

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[37] According to ECB statistics, the yield on the 10-year Spanish sovereign bond increased from 4% in the end of the year 2010 to 6.5% two years later

4.1.4 The dataset for Turkey

Turkey's dataset is comprised of quarterly observations that span from the first quarter of the year 1998 to the first quarter of the year 2016, reported in Table A4 in Appendix A.

According to the Turkish BRSA, NPLs in the Turkish banking system are defined as a total of three loan categories: loans with limited collectability, doubtful and loss loans (See Table 10).

Table 10. NPLs definition in the Turkish banking system

NPLs	
Loans with limited collectability	**1.** Debtor's creditworthiness has been deteriorated or, **2.** Full collection is unlikely without realizing collaterals since net realizable value of collaterals or debtor's own funds are inadequate to pay the debt on its maturity and loan loss is likely unless observed problems are removed, or, **3.** Past due principal and/or interest payments between 91 days and 180 days or, **4.** Having the opinion that collection of principal and /or interest will be past due more than 90 days from its maturity due to reasons such as having problems in the financing operating capital or creating additional liquidity due to unfavorable developments in macroeconomic conditions or in the sectors the debtor operates or, independent from all, due to adverse developments peculiar to the debtor, or, **5.** Classified as performing loans following the application of forbearance measures but principal and/or interest payments are past due more than 30 days within the one-year probation period or being subject to forbearance measures within the one year probation period.
Doubtful	**1.** Full collection of principal and/or interest in accordance with the contract is unlikely without realizing the collateral, or, **2.** Debtor's creditworthiness has deteriorated seriously but is not considered completely loss due to the potential contribution of opportunities such as merger, new financing facilities or capital increase to the debtor and collectability of the loan, or, **3.** Past due principal and/or interest payments between 181 days and one year from the due date, or, **4.** Expected delinquency in the payments of principal and /or interest more than 180 days from its maturity or due date due to unfavorable developments in macroeconomic conditions or in the sectors the debtor operates, or, independent from the above-mentioned ones, due to adverse developments peculiar to the debtor.
Loss	**1.** Nil or negligible collection is expected since the creditworthiness of the debtor is totally deteriorated, or, **2.** Despite having the qualifications for classifying in Group Three and Four, delinquency in payments more than one year is expected, or, **3.** Past due principal and/or interest payments more than one year from the due date.

Source: BRSA

As in the cases of Albania, Italy and Spain, Turkey's dataset includes variables that belong to the macroeconomic, the financial and the banking-industry environment. Apart from the typical macroeconomic variables that are considered potential credit risk drivers from the relevant literature (the real GDP and its components, the monetary aggregates M1, M2 and M3, the current account, the gross external debt, and the trade balance), additional indicators, specific to Turkish economy are included in the dataset such as the wholesale production index, the industrial production index and the construction activity index. Given that Turkey, is among the world's top producers (textiles, construction materials and others), it is expected that the above mentioned variables are negatively associated to NPLs in the Turkish banking system. Furthermore, the real effective exchange rate is another macroeconomic indicator considered a potential credit risk influencer with a negative effect on the latter; as the Turkish lira weakens NPLs will increase. The underlying reason is that similarly to the Albanian case, Turkish banks are well-known for the high degree of foreign-currency landing (ranging from 55% of the total loans in 2002 to 28% in the year 2010). Despite the fact that foreign currency lending was banned for consumer loans in 2009, corporations were still allowed to borrow under certain restrictions (Kutan et al., 2012).

Given the significant role that Turkey plays in the international markets as one of the biggest producers and traders of the world, a variety of indicators from financial markets are considered in the investigation. These are the London selling price of gold (usd/ounce), the Borsa Istanbul (BIST) gold index (closing price), the BIST 100 index (closing price), the Brent oil price and VIX. With the exception of VIX and the oil price, all variables are expected to have a negative impact on NPLs based on the assumption that as financial markets perform well, the likeliness of default on loans deteriorates (Beck et al., 2013). It is worth noting, that gold production and trade is one of the most important channels in the Turkish economy and therefore is assumed that as its price rises the quality of loans in the Turkish banking system will improve. On the other hand, higher oil prices and a greater VIX are expected to positively affect credit risk.

Lastly, the Italian and the Spanish sovereign debt spreads, calculated as the difference between the Italian and the Spanish 10-year government bond yields and the German one, are included in the dataset to uncover the European sovereign debt crisis' spillover effect to the Turkish NPLs. The underlying reason is the presence of one Italian and one Spanish bank in the Turkish banking system; according to the Banks Association of Turkey (2018) report, the position of the Spanish Banco Bilbao Vizcaya Argentaria (BBVA) is quite significant, considering that it holds half the shares of the fourth largest bank (Garanti BBVA) in Turkey asset wise whereas the Italian bank has a smaller impact. In case of a spillover effect in the Turkish banking system, the Italian and the Spanish sovereign debt spreads are expected to have a positive impact on NPLs.

Variables from the Turkish banking-industry considered in this research are : total credit, loans to assets ratio, the capital to assets ratio, loans to deposits ratio as well as the profitability ratios of the Turkish banks: ROA and ROE. As explained in the cases of Albania, Italy and Spain, the effect of credit, loans to deposits ratio and loans to assets ratio on NPLs is expected to be positive (Keeton, 1999; Salas and Saurina, 2002; Ali and Daly, 2010; Festic et al., 2011: Castro, 2013) whereas the effect of the capital to assets ratio and the profitability ratios ROA and ROE is ambiguous (Castro, 2013; Makri et al., 2014).

This section presented the dataset of each focal country by highlighting the respective credit risk proxies and the wide range of independent variables that are considered potential credit risk determinants. Apart from aligning the variables commonly suggested by the relevant literature, the presentation of each dataset aimed at surfacing the idiosyncratic features from the macroeconomic, banking-industry and financial environment that are expected to impact credit risk in each country. It becomes obvious from the datasets presentation that country-specific investigation is a necessary tool in capturing those specificities that may not be captured by cross-country studies.

The next section presents the methodological route followed in this research and the two cointegration techniques employed to investigate credit risk drivers: the autoregressive distributed lag model (ARDL) and the vector error correction model (VECM).

4.2. Methodology

Drawing on the datasets presentation in the previous section, the relation between credit risk and its explanatory variables in the focal countries, is described in the equation below:

Credit risk = f (Macro, Banking, Financial, Break) **(1)**

Where:

Credit risk is the selected credit risk proxy in each focal country,

Macro includes the potential macroeconomic determinants of credit risk,

Banking refers to the banking-industry's specific indicators,

Financial comprises indicators from financial markets,

Break refers to the moment in time that in accordance with the structural break tests' results represents a break in the credit risk' series.

The key steps of the methodological route followed for each country are presented below:

1. Applying the standard unit root tests: Augmented Dickey-Fuller (ADF) (1979) and Phillips and Perron (PP) (1988) as well as the structural break tests of Perron (1997) and Zivot and Andrew (1992).

2. Selecting the model that best explains credit risk in each country, after various specification searches.

3. Testing for cointegration between credit risk and the variables resulted significant from the previous step, through the autoregressive distributed lag model (ARDL) and the vector error correction model (VECM) and estimating both the short and the long-run relationship between them.

4. Estimating the generalized impulse response function derived from the vector autoregressive (VAR) model, introduced by Sims (1980), to uncover the dynamic interaction between credit risk and its explanatory variables.

The unit root tests, the VECM models and the impulse response analysis were employed using Eviews 7.1 whereas the ARLD models were estimated using Microfit 5.5 software.

4.2.1 Unit root tests

Nelson and Plosser (1982) were among the first to develop the concept on non-stationarity among various macroeconomic series, implying that the series may lack a fixed long-term mean, or with time, tend to deviate from any given initial point (Nelson and Plosser, 1982). Their work was followed by Engle and Granger (1987) that highlighted the importance of unit root tests while analyzing long-run relationships between macroeconomic variables. Since then, testing for stationarity of variables has become a key step prior to determining whether they are cointegrated or not. Hence, prior to the estimation process, it is imperative that all variables included in the dataset are tested for unit roots, that is, to identify if they move constantly in the long-run. Stationary series means a flat looking series, whose statistical properties (such as variance, autocorrelation) remain unchanged over time. Non-stationary series are time-dependent and have no tendency to return to long-run means since they suffer permanent effects from random shocks (Nelson and Plosser, 1982; Glynn et al, 2007). Non-stationary series though, can be turned into stationary ones when their first differences are taken (Granger, 1986; Glynn et al., 2007). However, for reasons that will be explained in the next subsection, this is not the ideal solution. Therefore determining the order of integration of the variables is a necessary step prior to establishing the cointegrating relationship especially when macroeconomic variables are present in the dataset as they typically contain unit roots (Phillips, 1986: Nelson and Plosser, 1982). However, as it will be highlighted later on in this

chapter, the ARDL approach to cointegration does not require all variables in the study to be integrated of the same order as it can be applied regardless of the order I(0) or I(1) of the variables' integration (Shahbaz and Islam, 2011).

The most widely used method to test for the presence of unit roots is the ADF test. Apart from the latter, this research also uses the PP test in order to crosscheck the results achieved from the ADF test. If the null hypothesis on the presence of a unit root is rejected it means that the series is stationary whereas the opposite will be assumed if the null hypothesis cannot be rejected. The Akaike Information Criterion (AIC) of Akaike (1974) and the Schwarz Information Criterion (SIC) of Schwarz (1978) are used to obtain the optimal lag length.

It is however worth noting, that in contrast to Nelson and Plosser (1982) who assumed that shocks have a permanent effect on the series' variance by making it time-dependent, Perron (1989) argued that most macroeconomic series return to deterministic trend after small and frequent shocks unless the latter are large and disastrous (Glynn et al., 2007). Thus, if structural breaks exist, the standard ADF tests are biased (Perron 1997; Zivot and Andrews, 1992). Given this, it is necessary to test for the endogenous presence of a structural break in the series. For this purpose, this research uses the Perron (1997) test and the Zivot and Andrews (1992) test. It is worth noting that, various structural breaks are visible among the plots of credit risk measures of the focal countries, i.e. NPLs in Spain started to rise in the year 2010, a period that coincides with the burst of the sovereign debt crisis in the country. Nevertheless, to obtain more accurate results both the Perron and the Zivot and Andrews tests are performed. Perron's (1997) unit root test allows for a break under both the null and alternative hypothesis. The Zivot and Andrews (1992) endogenous structural break test selects a break date that is equal to the minimum (most negative) t-statistic from the ADF test of unit root (Byrne and Perman, 2006; Glynn et al., 2007).

4.2.2 Model selection process

Having established the order of integration for each variable, the next step is to determine the model that best describes credit risk in each country. Given the considerable number of potential explanatory variables collected for each country (over twenty) it would be impossible to build a complex credit risk model that includes them all. Based also on the fact that simple models are easier to understand and interpret (Maddala, 2001), this research simplifies the credit risk model of each country based on the following approach:

First, following some very preliminary tests (bivariate regressions where credit risk has been regressed against each indicator at time t and also at all lags up to one year), a general credit risk model is constructed for each country that includes (at most five) variables that have been analyzed

in the respective empirical literature and that typically belong to the macroeconomic and the banking-industry environment. Apart from these common variables, country-specific variables that this research considers as highly-relevant to credit risk in each country are incorporated in each model.

Second, various specification searches are undertaken (i.e. variables deletion test or Wald test on coefficient restrictions) and therefore, variables found not to possess any meaningful additional information are discarded from the final model. The simplified model, comprised of variables with the best explanatory power on credit risk in each country, will then be tested for cointegration.

4.2.3 Cointegration analysis: ARDL and VECM modelling

Having completed step two, where after various specification searches, the model that best explains credit risk is chosen for each country we move on to performing the cointegration analysis. It was highlighted in subsection 4.2.1 that taking the first differences of non-stationary variables in order to turn them into stationary is not the ideal solution. Such action would be associated to two problems: Firstly, differencing the variables would mean differencing the error process in the regression and this would yield estimation problems. Secondly, if variables are differenced, the model cannot provide a long-run relationship between them, which is what most of the economists look up to (Asteriou and Hall, 2007). Given this, the need to have econometric models that eliminate non-stationarity among the variables while leaving them at their levels, has made cointegration analyses an econometric model of great importance. Despite the fact that the variables will be trended, there will be a tendency to move together in the long-run if they are truly strongly related (Asteriou and Hall, 2007). Moreover, trends will be eliminated by the error correction model (ECM) through the use of differenced residuals.

Among the cointegration methods applied in the relevant empirical literature, the Engle and Granger (1987) approach and the Johansen (1988) and Johansen and Juselius (1990) tests (the VECM) are the ones that appear most. The Engle and Granger (1987) cointegration approach has been extensively applied on single equation models whereas the Johansen (1988) and Johansen and Juselius (1990) tests are the most popular approaches in the case of multivariate equations. This research applies the autoregressive distributed lag (ARDL) approach to cointegration advanced by Pesaran and Smith (1998), Pesaran and Shin (1999) and Pesaran et al. (2001) and the vector error correction model (VECM) to determine credit risk drivers in Albania, Italy, Spain and Turkey. In contrast to VECM which is more frequently used in the relevant empirical literature, the ARDL approach has only gained attention recently. However, it holds certain econometric advantages over other cointegration techniques.

In contrast to the Johansen cointegration method, which is based upon multiple equations to estimate long-run correlation among the variables, the ARDL approach employs only a single reduced form equation (Pesaran & Shin, 1999). Furthermore, the ARDL approach is more reliable for small samples (30-80 observations) when compared to other traditional cointegration techniques (Pesaran & Shin, 1999; Haug 2002). The ARDL approach to cointegration can be successfully applied on variables of mixed I(0) or I(1) order of integration (Shahbaz and Islam, 2011). One should note that, it is most desirable that all variables that will be included in the cointegration analysis are integrated of the same order, as is the case with the VECM framework. However, cointegrating relationships might exist even among variables that possess mixed order of integration i.e. I(0), I(1) or I(2) (Asteriou and Hall, 2007). For this purpose, the VECM model is applied as an additional approach to validate the results of the ARDL approach, despite the fact that the variables are integrated of different orders.

Another advantage of the ARDL approach is that it allows various variables to appear in different numbers of optimal lags, selected on the basis of standard criterion such as Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC) (Mallick and Agarwal, 2007; Nikolaidou and Vogiazas, 2013; Shahbaz and Islam, 2011; Gila-Gourgoura and Nikolaidou, 2017).

Furthermore, the short-run and the long-run coefficients of the model are estimated simultaneously through the error correction version of the ARDL equation (Mallick and Agarwal, 2007; Gila-Gourgoura and Nikolaidou, 2017).

Equation (2) presents credit risk model to be estimated by the ARDL approach to cointegration:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{\rho} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{\rho} \alpha_{2i} \Delta X_{1t-i} + \sum_{i=1}^{p} \alpha_{3i} \Delta X_{2t-i} + \sum_{i=1}^{p} \alpha_{ni} \Delta X_{(n-1)t-i} +$$
$$\beta_1 Y_{t-1} + \beta_2 X_{1t-1} + \beta_3 X_{2t-1} + \beta_{ni} X_{(n-1)t-1} + \varepsilon_t$$

(2)

Where:

$N = 1,2,...N,$

Δ - the first difference operator,

α_i - corresponds to the short-run dynamics of the model,

β_i – represents the long-run relationship,

p - the optimal lag length that can differ for each variable and

ε_t - the white noise residuals.

In order to obtain the optimal lag length of each variable, the ARDL approach to cointegration estimates a considerable number of regressions. According to Pesaran and Pesaran (1997), when

working with quarterly data the optimal lag order is four periods whereas the SBC and the AIC select the optimal lag length of each variable. The existence of the long-run relationship is tested using the bound test approach of Pesaran, et al. (2001). The bound testing procedure is based on the F-test or the Wald-test statistics. Results from the F-test suggest whether the null hypothesis of no cointegration among the variables: $\beta 1 = \beta 2 = \beta 3 = \beta 4 = \beta 5 = 0$ can be rejected or that the long-run relationship among the variables exists ($\beta 1 \neq \beta 2 \neq \beta 3 \neq \beta 4 \neq \beta 5 \neq 0$).

Once a long-run relationship is established, the long-run estimates can be obtained as well as the speed of adjustment to equilibrium level after a shock that is captured by the error correction representation in equation (3) below:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=1}^{p} \alpha_{2i} \Delta X_{1t-i} + \sum_{i=1}^{p} \alpha_{3i} \Delta X_{2t-i} + \sum_{i=1}^{p} \alpha_{ni} \Delta X_{(n-1)t-i} + \beta EC_{t-1} + \varepsilon_t$$

$$(3)$$

Where:

β - the speed of adjustment parameter

EC - the residuals that are obtained from the estimated cointegration model of equation (2).

Although the ARDL approach to cointegration is the primary approach used in this study, the Johansen (1988) and Johansen and Juselius (1990) cointegration techniques are also employed as complementary tests to the ARDL, to ensure a higher results' accuracy. It was observed during the review of the empirical literature (See Chapter 2) that most of the related studies do not crosscheck their results through the use of various econometric techniques. In contrast, this research employs both the approaches, which complement each other thanks to their respective advantages. The ARDL procedure is a single equation technique that assumes one cointegrating vector. In multivariate equations, as is the case in this research, there may be present more than one cointegrating vectors thus, the Johansen's VECM procedure becomes relevant to identify these cointegrating vectors. The Johansen procedure verifies the validity of the ARDL procedure – i.e. it establishes whether there is only one cointegrating vector.

The Johansen method tests the presence of cointegrating vectors in non-stationary series through the maximum likelihood procedure. A multi-dimensional vector autoregressive model with Gaussian errors can be expressed as follows:

$$Y_t = \mu + A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_k Y_{t-k} + \varepsilon_t$$

$$(4)$$

Where:

$t=1,2,....T,$

Y_t - the r-dimensional matrix of the non-stationary variables

ε_t, - an r-dimensional vector of innovations.

If the Y_t variables cointegrate, then equation (4) can be represented as a VECM in equation (5) below:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + ... + \Gamma_{k-1} \Delta Y_{t-\kappa-1} + \Pi Y_{t-1} + \varepsilon_t \qquad \qquad \textbf{(5)}$$

Where:

$\Gamma_i = (I - A_1 - A_2 - ... - A_k) (i = 1, 2, ... , k-1)$ and

$\Pi = - (I - A_1 - A_2 - ... - A_k).$

Π is the matrix that conveys information regarding the long-run relationship among the variables. Π can be written as equal to $\alpha\beta'$ where α' will include the speed of adjustment to equilibrium coefficients while β' will be the long-run matrix of coefficients. Therefore the $\beta' Y_{t-1}$ term is equivalent to the error-correction term that contains up to $(n-1)$ vectors in a multivariate framework (Asteriou and Hall, 2007).

Johansen (1988) and Johansen and Juselius (1990), have provided two likelihood ratio test statistics of determining the number of cointegrating vectors: the trace statistic and the maximum eigenvalue statistic. When counting on the trace statistic, the null hypothesis tested is that the number of cointegrating vectors is less than or equal to r whereas in the case when the maximum eigenvalue statistics is used, the null hypothesis states that there are r versus $r+1$ cointegrating vectors. Critical values for both statistics are provided by Johansen and Juselius (1990).

As is the case in the ARDL approach, it is necessary to find the optimal lag length since it is required to have Gaussian error terms (i.e. standard normal error terms that do not suffer from non-normality, autocorrelation, heteroskedasticity etc) (Asteriou and Hall, 2007). Typically, the first step in selecting the optimal lag length is to estimate a VAR model starting from a large number of lags (i.e. 10 lags), then repeating the same procedure by cutting-down one lag each time until zero lags are reached. The model that minimizes AIC and SBC, is selected as the one with the optimal lag length.

Summing up, results from the VECM model will be used to crosscheck those achieved by the ARDL one and therefore if findings from both approaches agree, they may be considered highly reliable. One should note that, according to Peasaran et al. (2001), the inclusion of I(2) variables in the ARDL model would provide spurious results. However, this is not the case in this research since

the unit root tests results prove that all variables included in the ARDL model are integrated of order zero or one I(0) or I(1). Furthermore, while the ARDL approach to cointegration can be applied also in the cases when the variables' order of integration is mixed: I(0) and I(1) variables, that is not the case in the VECM framework given that different orders of integration among variables may produce spurious results (Asteriou and Hall, 2007). Still, if cointegration among the variables really exists, their mixed order of integration will not present an obstacle in confirming the long-run relation (Asteriou and Hall, 2007).

4.2.3 The impulse response analysis

The dynamic interactions between the credit risk metrics of each focal country and the explanatory variables are uncovered by the impulse response functions. Individual coefficient estimates on a VAR model only provide limited information on how one variable in the system reacts to shocks affecting other variables (Nkusu, 2011). Therefore, impulse response functions have been widely used by the relevant literature to measure a model's dynamic behavior. According to Mallick and Dash (2015): *"Impulse response functions trace out the response of current and future values of each of the variables to one unit increase in the current value of the VAR errors, assuming that this error returns to zero in subsequent periods and that all other errors are equal to zero"* (Mallick and Dash, 2015, p. 69).

In this research, the impulse response functions derived from the respective VECMs, are presented as to check the robustness of results. Given that there are a number of problems related to the standard confidence bands (Herzer et al. 2015), they are not included in the charts.

4.3 Conclusions

This chapter displayed and discussed the dataset of each focal country along with the econometric techniques employed in the empirical part of this study. Moreover, data limitations regarding their availability and reliability were highlighted and the advantages and shortcomings of each approach applied were discussed. Due to data unavailability, the credit risk proxy in the case of Italy differs from the one used in the other three focal countries. Specifically, the ratio of the flow of new bad loans to the total performing loans in the previous quarter is the credit risk proxy of the Italian banks whereas for Albania, Spain and Turkey credit risk is proxied by the NPLs ratio. However, the flow of new bad loans is considered an accurate measure of credit risk of the Italian banks and has been used as such in a variety of studies that have investigated credit risk determinants in Italy (Quagliariello 2004; Marcucci and Quagliariello 2008; Filosa 2007; Bofondi and Ropele 2011). Quarterly data that span from the first quarter of 1998 to the first quarter of 2016 (with the

exception of Albania, for which data are available since 1998Q4), for a comprehensive set of potential explanatory variables from the macroeconomic, financial and banking-industry environment have been considered for each focal country. Special attention is paid to those country-specificities that are believed to have a significant impact on the respective credit risks (i.e. the Italian debt crisis spread, calculated as a difference between the 10-year Italian and German bond yields, in the case of Italy and the real effective exchange rate in the case of Turkey). Prior to establishing the cointegrating relationship between credit risk and its explanatory variables, two unit root tests (ADF and PP) are applied to determine the order of integration of variables along with two other tests (PP and AZ) that check for the existence of any structural break among the series. Next, model selection is performed in each country based on various specification searches made on the general credit risk models met in the current literature. Having established the model that best explains credit risk in each country, the investigation of credit risk determinants is based on two distinctive cointegration approaches: the ARDL approach and the VECM framework. Furthermore, the impulse response analysis is applied as a fourth step in ore analysis as to uncover the dynamic interactions between credit risk of each country and its explanatory variables. To the author's knowledge, this is the first empirical work that employs the ARDL approach for credit risk modeling in each of the focal countries. Given the advantages that this approach holds towards other cointegration techniques (See page 82), it is considered the primary estimation technique of this study whereas the VECM framework is applied to cross-check the results of the ARDL approach and ensure their accuracy.

Having presented each focal country's dataset and the methodological route that is followed in the thesis, the next step consists of displaying and discussing the empirical results.

Chapter 5: Empirical findings

Introduction

As highlighted in the preceding chapters, the aim of the empirical analysis is to provide evidence on the determinants of credit risk in the banking systems of Albania, Italy, Spain and Turkey. For this purpose a comprehensive set of quarterly data is used, from the macroeconomic environment, financial markets and each country's banking system, over the period 1998-2016. This timeline covers the big economic and financial boom (1998-2007), the burst of the global financial crisis (2008-2009), the recent European sovereign debt crisis (2010-2012), which is particularly relevant to two of the focal countries, namely, Italy and Spain and the successive years up to 2016Q1. While focusing on the key credit risk determinants as recognized by the relevant theoretical literature and embraced by the existing empirical studies, special attention is paid to the individual features of each country which are believed to affect the lending quality. Considering the current turbulence in the Eurozone, seeking to identify country-specific factors that explain credit risk in the banking systems of the focal countries, is crucial.

As pointed out in Chapter 4, the empirical investigation is based upon the cointegration analysis and the ARDL approach to cointegration advanced by Pesaran and Smith (1998), Pesaran and Shin (1999) and Pesaran et al. (2001) is the primary approach applied, given the advantages that it holds compared to other cointegration techniques, such as the fact that it can be applied regardless of the mixed order of integration I(0) or I(1) of the variables, as is the case for the variables considered in this research. Results for each country are crosschecked by applying the maximum likelihood procedures proposed by Johansen (1988) and Johansen and Juselius (1990), such as the VECM, an approach which is more frequently used in the empirical literature on credit risk compared to the ARDL approach.

The chapter is organized in five sections; the first four sections outline the empirical findings for each country derived from the four-step methodological route: the application of the unit root tests, model selection process, the employment of the two cointegration techniques: the ARDL approach to cointegration and the Johansen cointegration test (VECM) and as a final step the estimation of the impulse response functions. A summary of the key steps followed and of the results achieved is presented in Section 5.5.

5.1 Albania

5.1.1 Unit root tests results for Albania

As previously mentioned (See Chapter 4), unit root testing is performed through two distinctive steps: first, the standard tests of Augmented Dickey-Fuller (1979) and Phillips and Perron (1988) are conducted to each of the time series, followed by the unit root tests of Perron (1997) and Zivot and Andrew (1992) that allow for a structural break on trend. The unit root tests' results for Albania indicate that all series are integrated of order zero and one (these results are reported in Tables B1 and B2 in the Appendix). The Perron (1997) test detects a structural change on the third quarter of the year 2001 whereas the Andrew and Zivot (1992) test results suggest the existence of a break on the first quarter of the year 2002. As explained in Chapter 3, the first innovative reform in the Albanian banking system occurred towards the end of year 2000, when the oldest commercial bank, BKT, was privatized. This event led to new experience, expanded knowledge and advanced technology in the field of banking and therefore the negative effect on the stock of bad loans was quite significant. To this extent, a dummy is created that takes the value 1 at the third quarter of year 2001, when the NPLs stock started the downward trend. In order to capture any potential effect from the recent GFC a dummy valued 1 from 2008Q3 onwards is created.

5.1.2 Model selection process for Albania

Having established the order of integration for each variable, the next step is to determine the model that best describes credit risk in Albania. As mentioned in the methodological route description (See chapter 4, page 70), following very preliminary tests (bivariate regressions), a general model is constructed that includes the common variables met in the current literature on credit risk for Albania. Specifically, macroeconomic variables such as the monetary aggregates (that proxy GDP) M1 and M2 are included in the model as well as bank-specific variables such as the loans to assets ratio (LASS), the capital to assets ratio (CAP) and the return on equity (ROE).

Apart from the common variables, idiosyncratic (country-specific) variables that are considered highly-relevant to credit risk in Albania are incorporated in the model. Specifically, the proxy of the Italian sovereign debt crisis risk (ITSPREAD), calculated as the spread between the yield on the 10-year Italian government bond and the corresponding German one, is added in the model given that Italy and Albania are interlinked through their trade-channels and banking systems (See chapter 4, page 59). Moreover, the ratio of real estate loans to total loans (RELR) is an extra variable incorporated in the model, given the high relevance of the construction sector to the Albanian economy (See chapter 4, page 60).

After various specification searches (i.e. Wald test of coefficient restrictions), variables found not to possess any meaningful additional information are discarded from the final model. As a result, the equation that best describes the determinants of credit risk in the Albanian banking system is as follows:

$$NPL = f (NPL_{-t}, ITSPREAD, CAP, M1, D01) \qquad \textbf{(6)}$$

Where :

NPL - the ratio of non-performing loans,

NPL_{-t} - the lagged value of NPL,

ITSPREAD - the Italian sovereign debt crisis risk proxy,

CAP - the capital to assets ratio,

M1 - the proxy for money supply and

D01 – the dummy that takes the value 1 at the third quarter of year 2001 and captures the instant when the NPLs stock started the downward trend as a result of banking sector reforms in Albania.

5.1.3 Cointegration analysis for Albania

Having established the model that best explains credit risk in Albania we proceed to testing that model for cointegration within the ARDL framework, through two steps: First, based on the Schwartz-Bayesian Criterion, which is the recommended criterion by Pesaran and Shin (1998) as the most consistent model selection criterion, the optimal lag length of each variable in the model is specified. Specifically for Albania, an ARDL (1,0,0,0) is selected. Second, the bounds testing procedure of Pesaran et al. (2001) is applied to equation (6) to establish a long-run relationship among the underlying variables through the use of F-statistics and W-statistics, which test the significance of the lagged levels of the variables in a univariate equilibrium correction mechanism. If the estimated values of the F-statistic and the W-statistic exceed the upper critical bounds, the null hypothesis of no cointegration among the variables may be rejected. In our case, the F-statistic is 9.038, thus greater than the upper bound of 4.59 at the 5% significance level, as reported in Table 11. Furthermore, the W-statistic of 36.152 is greater than the upper bound of 18.35 at the 5% level of significance. Thus, it is confirmed that a long-run relationship exists between NPL, Italian sovereign risk spread (ITSPREAD), capital to assets ratio (CAP), money supply (M1) and the dummy D01.

Table 11. The bounds testing results for Albania

test-statistic	5%		10%	
	Lower bound	Upper bound	Lower bound	Upper bound
F-statistic **9.0380**	3.4306	4.5893	2.8391	3.8945
W-statistic **36.1521**	13.7222	18.3572	11.3562	15.5778

The long-run estimates suggested by the ARDL approach (t-statistics in parentheses) are given in equation (7) below:

$$NPL = 5.21 + 0.08\ ITSPREAD* + 0.17\ CAP* - 0.53M1* - 7.12\ D1** \qquad \textbf{(7)}$$
$$\quad (1.63) \qquad (1.86) \qquad\qquad (1.7) \qquad (-1.68) \qquad (-2.57)$$

Where *, ** and *** denote 10%, 5% and 1% level of significance.

It appears that all variables are significant in the long-run at the 5% and 10% levels of significance and have the expected effect on NPLs. The Italian sovereign debt crisis risk (captured by ITSPREAD) has a positive effect on the NPLs ratio in Albania indicating that the latter is quite sensitive to the economic and financial performance of the neighbor country (Italy).

As explained in Chapter 4, the effect of the capital to assets ratio on credit risk is ambiguous; in the case of Albania, a higher capital to assets ratio is associated to more NPLs, since the coefficient of CAP is significant and bears a positive sign. Money supply, M1, that proxies economic growth, has the expected negative effect on credit risk in Albania.

According to the error correction model presented in Table 12, the above mentioned variables impact credit risk of the Albanian banking system also in the short- run. The error correction term (ECT) is significant and bears the correct sign. Estimated at -0.04, the ECT suggests that around 4% of deviation of the flow of the new bad loans ratio from its equilibrium in the previous quarter gets corrected in the current one.

As observed in Table 13, the specific ARDL model passes all the diagnostic tests.

Table 12. The ECM of the ARDL (1, 0, 0, 0) regression for Albania

Regressor	Coefficient	t-ratio
ΔITSPREAD	0.0034	1.694
ΔCAP	0.0067	2.588
ΔM1	-0.0207	-1.931
ΔD01	-0.2806	-18.811
ECT_{t-1}	-0.0394	-2.669
R^2=0.876; $F(5,63)$= 89.03		

Table 13. Diagnostic Tests for the Albanian ARDL (1, 0, 0, 0) model

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ(4)= 7.8887 [.096]	F(4, 59)= 1.9040 [.122]
B: Functional Form	CHSQ(1)= 1.0089 [.315]	F(1, 62)= 0.9200 [.341]
C: Heteroskedasticity	CHSQ(1)= 2.7085 [.100]	F(1, 67)= 2.7374 [.103]

Moving on to the second cointegration method, the Johansen (1988) and Johansen and Juselius (1990) approach, the first step is to determine the appropriate number of lags. To do this, this study estimated first a regular vector autoregressive (VAR) model, starting with a lag length of four and then reducing it at two lags, the number where most of the criteria agreed (See Table C1 in Appendix C). According to both the Trace statistic and the Maximal Eigenvalue statistic, there exists one cointegrating vector among the variables at the 0.05 level and therefore the long-run relationship between NPL, ITSPREAD, CAP and M1 is confirmed (See Table 14).

Table 14. Summary results from the Johansen cointegration test for Albania*

Trace test				
No. of CE(s)	Eigenvalue	Trace stat	0.05 critical value	Probability***
None**	0.447562	59.8785	47.85613	0.0025
At most 1	0.226022	20.1198	29.79707	0.4148
Maximum eigenvalue				
No. of CE(s)	Eigenvalue	Max-eigen stat	0.05 critical value	Probability***
None**	0.447562	39.75869	27.58434	0.0009
At most 1	0.226022	17.16623	21.13162	0.1643

Note:

*based on linear deterministic trend.

** denotes rejection of the null hypothesis of no cointegration at the 0.05 level.

*** MacKinnon-Haug-Michelis (1999) p-values.

Given the above, the VECM is estimated using two lags and the normalized cointegrating coefficients are presented in Table 15. All the coefficients are significant and bear the expected sign, specifically, ITSPREAD and CAP have a positive significant effect on the NPLs whereas M1 affects the latter negatively.

The cointegrating equation suggested by the VECM is:

$$NPL= 6.86 + 0.1\ ITSPREAD*** + 0.17\ CAP*** - 0.66\ M1** - 0.3D1*** \qquad (8)$$

$$\quad\quad\quad\quad (3.18) \quad\quad\quad\quad (3.49) \quad\quad (3.12) \quad\quad (23.35)$$

Where *, ** and *** denote 10%, 5% and 1% level of significance.

The ECT measures the correction from disequilibrium of the previous period, more precisely, the extent to which any disequilibrium in the previous period affects any adjustment in NPL (Asteriou and Hall, 2007). In the case of Albania, the ECT's value of -0.04 suggests that 4% of the disequilibrium in NPLs is offset by the short-run adjustment in the same quarter. The dummy D01, introduced as an exogenous variable in the VECM is highly significant, with a t-ratio of -23 (See Table 15). The VECM results are in line with those suggested from the ARDL model. The long-run coefficients derived from the VECM are quite similar to those derived from the ARDL model (with the exception of D01 which has a much higher coefficient in the case of VECM) and bear exactly the same sign although at a higher significance.

Table 15. VECM results for Albania

Normalized cointegrating coefficients (t-statistics in parentheses)				
NPL	ITSPREAD	CAP	M1	D01
1.000000	-0.10	-0.1734	0.6618	-0.30
	(-3.1811)	(-3.489)	(3.1292)	(-23.355)
ECT	-0.0454			
	(-5.2866)			
R-squared	0.919			
Adj. R-squared	0.9			
Akaike AIC	-5.8726			
Schwarz SC	-5.5107			
F-statistic	63.75			

Overall, findings for Albania from both the ARDL and the VECM approach suggest that macroeconomic factors, bank-specific variables and idiosyncratic features define credit risk in the Albanian banking system. Specifically, money supply (M1) has the expected negative effect on credit risk as apparently an increase in money supply improves the quality of loans. Such result is strongly supported, among other studies, by Quagliariello (2004), Nikolaidou and Vogiazas (2013) and Nikolaidou and Vogiazas (2017).

Furthermore, it appears that capital to assets ratio is positively related to credit risk in Albania. This finding is supported at the theoretical level by several studies (Koehn and Santomero, 1980; Kim and Santomero, 1988; Makri et al., 2014; Chiorazzo et al., 2014), according to which highly capitalized banks that are forced to reduce leverage are tempted to undertake greater risk that will generate higher income. According to Bank of Albania (2018) financial stability report, small banks and those with foreign capital have the highest level of Capital Adequacy Ratio. Considering that foreign owned banks account for 88% of the assets size of the Albanian banking system and the latter is constantly reporting high NPLs, findings of this research sound rational and provide implications for regulators engaged in the capital adequacy issue.

The results also provide evidence that the Albanian credit risk is sensitive to the sovereign debt crisis in Italy captured by ITSPREAD, considering the ties that exist among the two countries in the trade sector and banking systems. Moreover, the evidence for Albania, that is not an EU-member country, provides support to the hypothesis that the sovereign debt crisis has not only affected the European countries involved in it or other core Euro area countries whose banks hold a lot of sovereign debt. Contagion has emerged also among the emerging economies of Europe, interlinked with the developed markets though their banking systems or trade channels as is the case of Italy and Albania.

Findings of this research are new in the literature that investigates credit risk in Albania since the existing studies suggest the significance of other macro and micro-economic variables to credit risk such as, GDP growth, unemployment rate, loans to assets ratio and return on equity. For instance, Shingjergji (2013a,b) used the single regression model to estimate the effect of macroeconomic and bank-specific variables on credit risk of the Albanian banking system over the period 2002-2012 (in the case of bank-specific variables) and 2005-2012 (in the case of macroeconomic variables), based on quarterly data. Results indicate that loans to assets ratio, the return on equity and the inflation rate are negatively related to NPLs ratio whereas GDP growth, interest rates and the Eur/ALL exchange rate seem to have a positive effect on NPLs. In the same line, Gremi (2013) employed the simple regression model on quarterly data of macroeconomic variables and the NPLs ratio over the period: 2005-2013, to conclude that NPLs in Albania are negatively related to GDP growth and

positively related to interest rates. It is evident though, that these studies fail to consider the effect of bank/trade "linkages", lack the employment of complementary and advanced econometric techniques and are focused on shorter time intervals compared to the one considered by this research.

5.1.3 Impulse Response Analysis for Albania

Having established the cointegrating relationship among NPLs, the Italian debt crisis risk proxy (ITSPREAD), money supply (M1) and the capital to assets ratio (CAP) for Albania, the impulse response functions are estimated to describe credit risk evolution in reaction to a shock in each explanatory variable.

The impulse responses estimated for Albania, are presented in Figure D1 in the Appendix D. According to the first graph, NPL in Albania increases as a result of a one standard deviation shock in ITSPREAD. Similarly, the second graph indicates that NPL increases when there is a one standard deviation shock in CAP. In contrast, the third graph indicates that a shock in M1 causes a sharp decline on NPL. Overall, the impulse response functions indicate that shocks to the above mentioned variables affect NPLs in the Albanian banking system in the directions suggested by the two empirical approaches employed in this research. That is, shocks to ITSPREAD and CAP will have a positive impact on NPLs whereas shocks to M1 will have a negative impact on NPLs.

5.2 Italy

5.2.1 Unit root tests results for Italy

In the case of Italy, the standard unit root tests suggest that all series are I(0) or I(1) (See Tables B3 and B4 in Appendix B). Both the Perron (1997) unit root test and the Andrew and Zivot (1992) test confirm the existence of a structural break on the third quarter of the year 2008 which coincides with the initiation of the global financial crisis. This break seems quite reasonable considering that the flow of bad loans in the Italian banking system started to grow in the years following the GFC. To capture such effect, a dummy is created that takes the value 1 from 2008Q3 and on.

5.2.1 Model selection process for Italy

Having established the order of integration of variables, the successive step consists of specifying the model that best describes credit risk in Italy. As in the case of Albania, following very preliminary tests (bivariate regressions), a general model is constructed that includes the common variables met in the existing literature on credit risk for Italy. Specifically, macroeconomic variables such as the real GDP, M1 and the unemployment rate (UNE) are included in the model as

well as bank-specific variables such the capital to assets ratio (CAP) and the interest rates on loans (CINT) and deposits (DINT). Apart from the common variables, country-specific variables that are considered highly-relevant to the flow of new bad loans in Italy are incorporated in the model. Specifically, the proxy of the Italian sovereign debt crisis risk (calculated as the spread between the yield on the 10-year Italian government bond and the corresponding German one) and the market volatility index (VIX) are added in the model as potential credit risk drivers, given the sovereign debt tensions in Italy and their direct connection to investors' expectations of volatility in the financial markets.

Furthermore, after various specification searches (i.e. Wald test of coefficient restrictions), variables found not to possess any meaningful additional information are discarded from the final model. As a result, the equation that best describes the determinants of the flow of new bad loans in Italy according to the ARDL approach is as follows:

$$NBLR = f\ (NBLR_{-t},\ SPREAD,\ CAP,\ VIX) \tag{9}$$

Where :

NBLR - the ratio of the flow of new bad loans to total performing loans in the previous quarter,

$NBLR_{-t}$ - the lagged value of NBLR,

SPREAD - the Italian sovereign debt crisis risk proxy,

CAP - the capital to assets ratio and

VIX - the market volatility index.

5.2.2 Cointegration analysis for Italy

Having selected the model that best explains credit risk in Italy, we move on to cointegration analysis within the ARDL framework. The selected ARDL specification based on the Schwartz-Bayesian Criterion is ARDL (4,4,0,1). The F-statistic and the W-statistic are higher than the upper bounds of 4.61 and 18.45 respectively at the 5% significance level, reported in Table 16.

Table 16. The bounds testing results for Italy

test-statistic	5%		10%	
	Lower bound	Upper bound	Lower bound	Upper bound
F-statistic **10.9871**	3.4109	4.6132	2.8264	3.9381
W-statistic **43.9483**	13.6438	18.4528	11.3055	15.7526

Thus, the null hypothesis of no long-run relationship between NBLR, sovereign risk spread (SPREAD), capital to assets ratio (CAP) and market volatility index (VIX) can be rejected. The long-run estimates suggested by the ARDL approach (t-statistics in parentheses) are presented in equation (10) below:

$$NPL= 0.01** + 0.11\,SPREAD*** + 0.004\,CAP** + 0.1VIX*** \qquad (10)$$
$$\quad\ (2.55) \qquad\quad (4.03) \qquad\qquad (2.54) \qquad\quad (3.17)$$

Where *, ** and *** denote 10%, 5% and 1% level of significance.

The spread that proxies the sovereign debt crisis risk positively affects the new bad loans ratio implying that conflicts in the sovereign debt market (captured by SPREAD, the spread differential between Italian and German 10-year government bond yield) are also transmitted to Italian banks, affecting particularly the quality of their loans. Highly capitalized banks seem to have a high level of new bad loans in the Italian banking system as they aim to engage in riskier activities. The market volatility index (VIX) has a significant positive effect in the long-run implying that potential fear in the market causes an increase in bad loans. It may be assumed that the statistical significance of VIX captures also the effect of the GFC, which was not proved to have a direct significant effect on the ratio of new bad loans, in the case of Italy. Specifically, the dummy variable capturing the crisis onset in the end of year 2008, constructed in accordance with the unit roots with a structural break tests results, was not significant and as such was dropped from the model.

Table 17. The ECM of the ARDL (4, 4, 0, 1) regression for Italy

Regressor	Coefficient	t-ratio
ΔNBLR1	-0.415	-3.769
ΔNBLR2	-0.186	-1.592
ΔNBLR3	-0.391	-4.394
ΔSPREAD	0.021	0.100
ΔSPREADD1	0.084	-3.546
ΔSPREADD2	0.077	-3.749
ΔSPREADD3	0.053	-2.716
ΔCAP	0.001	1.995
ΔVIX	-0.749	-0.363
ECT $_{t\text{-}1}$	-0.445	-4.666
R² =0,76; **F**(11,57) = 18.35		

The error correction model presented in Table 17, indicates that with the exception of the market volatility index (VIX), all the above mentioned variables affect credit risk also in the short- run. The error correction coefficient is negative and highly significant. Estimated at -0.44, the ECT suggests that around 44% of deviation of the flow of the new bad loans ratio from its equilibrium in the previous quarter gets corrected in the current one.

As observed in Table 18, the estimated ARDL model passes all the diagnostic tests.

Table 18. Diagnostic Tests for the Italian ARDL (4, 4, 0, 1) model

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ(4)= 5.6356 [.228]	F(4, 52)= 1.1562 [.341]
B: Functional Form	CHSQ(1)= 1.6147 [.204]	F(1, 55)= 1.3180 [.256]
C: Heteroskedasticity	CHSQ(1)= 0.1068 [.744]	F(1, 67)= 0.1039 [.748]

The second approach followed as to ensure the accuracy of the results obtained from the ARDL approach is the Johansen (1988) and Johansen and Juselius (1990) cointegration analysis. As in the case of Albania, firstly a regular vector autoregressive (VAR) model is estimated and according to the lag length selection criteria, the number of four lags is the appropriate one to use while testing for cointegration (See Table C2 in Appendix C). Results suggested by the Trace statistic and the Maximal Eigenvalue statistic are reported in Table 19. According to both the Trace statistic and the Maximal Eigenvalue statistic there exists one cointegrating vector among NBLR, SPREAD, CAP and VIX. Results are significant at the 5% level of significance.

Table 19. Summary results from the Johansen cointegration test for Italy*

Trace test				
No. of CE(s)	Eigenvalue	Trace stat	0.05 critical value	Probability***
None**	0.352632	48.35368	47.85613	0.0449
At most 1	0.152088	18.78451	29.79707	0.5085
Maximum eigenvalue				
No. of CE(s)	Eigenvalue	Max-eigen stat	0.05 critical value	Probability***
None**	0.352632	29.56916	27.58434	0.0274
At most 1	0.152088	11.21851	21.13162	0.6255

Note:

*based on linear deterministic trend.

** denotes rejection of the null hypothesis of no cointegration at the 0.05 level.

*** MacKinnon-Haug-Michelis (1999) p-values.

Considering this, the VECM is estimated using four lags and the normalized cointegrating coefficients are presented in Table 20. All the coefficients are significant and bear the expected sign, specifically, SPREAD, CAP and VIX have a positive significant effect on the flow of new bad loans in Italy (NBLR). The long-run estimates suggested by the VECM are:

$$NBLR = 0.02 + 0.05\ SPREAD^{**} + 0.008\ CAP^{*} + 0.0001\ VIX^{*} \qquad\qquad \textbf{(11)}$$

$$ (2.36) \qquad\qquad (4.59) \qquad\qquad (4.12)$$

Where *, ** and *** denote 10%, 5% and 1% level of significance.

The ECT component has a significant negative value. Specifically, the ECT's value of -0.47 suggests that 47% of the disequilibrium in NBLR is offset by the short-run adjustment in the same quarter. Hence, The VECM results comply with those derived from the ARDL model; long-run coefficients derived by both the approaches are quite similar, of high significance and bear exactly the same sign.

Table 20. VECM results for Italy

Normalized cointegrating coefficients (t-statistics in parentheses)			
NBLR	SPREAD	CAP	VIX
1.000000	-0.052394	-0.0087	-0.0001
	(-2.36287)	(-4.59847)	(-4.12991)
ECT	-0.47468		
	(-4.36548)		
R-squared	0.78		
Adj. R-squared	0.70		
Akaike AIC	-11.74322		
Schwarz SC	-11.15570		
F-statistic	10.49		

Overall, findings from both the approaches (ARDL and VECM) are in line with similar empirical studies performed for other countries (Louzis et al., 2012; Klein, 2013) and agree with some of the results achieved by the existing empirical studies performed for Italy (Quagliariello, 2004; Albertazzi et al., 2013; Chiorazzo et al., 2014). To our knowledge, the effect of the sovereign debt

spread (captured by the differential between Italian and German 10-year government bond yield) on the flow of new bad loans in the Italian banking system has not been previously investigated. Quagliariello (2004) though, provided evidence that the Italian long-term government bond yield is positively related to the ratio of new bad loans in Italy, when a panel of banks were analysed over the period 1985-2002. Moreover, there is evidence that the sovereign debt spread affects other potential credit risk indicators in Italy, such as the loan-loss provisions. More precisely, the study of Albertazzi et al. (2013) which also employs the ARDL approach on aggregate bank data over the period 1991-2011, concludes that a higher sovereign debt spread is associated to a reduction in bank productivity and in particular, sovereign risk has a negative impact on loan-loss provisions. The authors argue that the increase in sovereign risk could worsen credit quality in Italy, since it is associated to deterioration of economic conditions and therefore to a weakened financing position of firms. It is worth mentioning that, similar results that confirm the positive effect of sovereign debt on credit risk are also achieved for a country very similar to Italy in terms of high indebtedness, namely, Greece. Louzis et al. (2012) have provided evidence that sovereign debt proxied either by the public debt to GDP ratio or the spread differential between the Greek and the German 10-year government bond yield, has a positive effect on the NPLs ratio in the Greek banking system. Furthermore, Makri et al. (2014) concluded that public debt positively affects NPLs when 14 countries of the Eurozone (including Italy) were investigated over the period 2000-2008. Hence, our evidence on Italy provides support to the relevant empirical evidence and all the theoretical considerations on the positive relation between sovereign debt and credit risk, by suggesting that a high sovereign debt spread is associated to an increase in the flow of new bad loans in the case of Italy.

Furthermore, the positive statistically significant effect of CAP implies that highly capitalized banks tend to embrace higher credit risk in the case of Italy. This result is in agreement with the theoretical considerations of Koehn and Santomero (1980), Kim and Santomero (1988), Fiordelisi et al. (2010) and Chiorazzo et al. (2014), according to which the risk-taking behavior is more common in well capitalized banks since they want to be compensated for the cost of maintaining high capital levels. It is worth noting that, in contrast to our results, Filosa (2007) has concluded that increases in banks' capital improve the quality of loans in the Italian banking system. Still, his results were based on a measure of capital to assets ratio, that differs from the one used in this research, more precisely, the free capital (from fixed assets) to loans ratio. However, our results are in line with those achieved by the study of Chiorazzo et al. (2014) which analyzed 38 Italian banks over the period 2006-2012 and provided evidence that an increasing interest income and a higher capital to assets ratio are associated to a higher credit risk, in the Italian banking system.

Lastly, the effect of the bond market volatility index (VIX) on credit risk has been evidenced by the study of Klein (2013) according to which, a higher volatility index reduces firms' capacity to repay their loans and therefore increases NPLs in Central, Eastern and South-Eastern Europe. In the case of Italy, the market volatility index has a significant positive effect on the flow of new bad loans, in the long-run, implying that sudden changes in uncertainty as proxied by jumps in the VIX index cause an increase in bad loans. Such effect on the flow of new bad loans in Italy has not been previously analysed despite the fact that a decade has passed since the onset of the GFC, a major shock which was certainly associated to an increased uncertainty. The finding that higher volatility in the bond market is positively related to the flow of new bad loans in Italy, is quite relevant to the actual sovereign debt tension in the Eurozone where Italy is significantly involved and therefore any increase in the wait-and-see attitude of the investors will weaken the borrowers' repayment capacity or otherwise generate a higher flow of bad debts.

5.2.3 Impulse Response Analysis for Italy

In the case of Italy, the impulse response analysis (presented in Figure D2 in the Appendix D) describes the responses of NBLR to shocks in its explanatory variables: the Italian debt crisis risk proxy (SPREAD), the capital to assets ratio (CAP) and the market volatility (VIX). The three graphs indicate that NBLR increases as a result of a one standard deviation shock in SPREAD, CAP and VIX. Hence, the Italian impulse response analysis indicates that shocks to the above mentioned variables significantly affect NBLR in the directions suggested by the two empirical approaches employed in this research. That is, shocks to SPREAD, CAP and VIX will have a positive impact on NBLR.

5.3 Spain

5.3.1 Unit root tests results for Spain

In the case of Spain, the standard ADF and PP tests for unit roots suggest that all variables are I(0) or I(1)[38] (See Tables B5 and B6 in the Appendix). A structural break on the third quarter of 2010 is evidenced by both the Perron (1997) and Andrew and Zivot (1992) tests. This period coincides with the beginning of the European debt crisis precipitated by the Greek bailout plan in May 2010 and followed by similar emergency loans granted to Ireland Portugal and Spain. Therefore, a dummy that takes the value of 1 for 2010Q3 onwards was created. Considering that Spain was one of the "most spoken of" European countries, in the aftermath of the recent GFC, also another dummy was

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[38] It is worth noting, that the unemployment rate, which is considered one of the all-time problematic features of Spain due to its historic high-levels (See details on Chapter 3), resulted to contain two unit roots, when both the ADF and the PP tests were applied. Given this, it was dropped from the model since results from the ARDL approach may be spurious in the presence of I(2) variables (Pesaran et al, 2001).

created, to capture the crisis' effect, which takes the value of 1 for the period 2008Q1-2013Q3 and partially includes also the debt crisis effect.

5.3.2 Model selection process for Spain

Having established the order of integration of variables, the following step is to determine the model that best describes credit risk in Spain. As in the cases of Albania and Italy, a general model is constructed that consists of a maximum of five independent variables that are mostly analyzed in the existing literature for Spain. Specifically, a few macroeconomic variables such as the real GDP growth and the inflation rate (CPI) are incorporated in the model as well as bank-specific variables such the capital to assets ratio (CAP), total credit (CRED) and the return on equity (ROE). Apart from the common variables, idiosyncratic (country-specific) variables that are considered highly-relevant to credit risk in Albania are incorporated in the model. Specifically, the Spanish long-term government bond yield (LTGB) and the Spanish sovereign debt risk spread (SPREAD), measured by the difference between the Spanish 10-year government bond yield and the German one are incorporated among the deterministic variables of credit risk in Spain given the country's high indebtedness. As in the cases of Albania and Italy, after various specification searches (i.e. Wald test of coefficient restrictions), variables found not to possess any meaningful additional information are discarded from the final model. As a result, the equation that best describes the determinants of credit risk in the Spanish banking system is as follows:

$$NPL = f(NPL_{-t}, LTGB, CAP, ROE, CRED, D08) \tag{12}$$

Where:

NPL - the ratio of non-performing loans to total loans,

NPL_{-t} - the lagged value of NPL,

LTGB - the 10-year Government bond rate,

CAP - the capital to assets ratio,

ROE - the return on equity ratio,

CRED - the total credit granted by the Spanish banks and

D08 - the dummy created to capture the effect of the GFC.

5.3.3 Cointegration results for Spain

Having established the model that best explains the NPLs ratio in Spain, we move on to cointegration analysis. According to the Schwarz - Bayesian Criterion, an ARDL (1,0,0,1,0) is

selected. Results from the bounds testing methodology of Pesaran et al (2001) are reported in Table 21.

Table 21. The bounds testing results for Spain

test-statistic	5%		10%	
	Lower bound	Upper bound	Lower bound	Upper bound
F-statistic **8.089**	3.3731	4.6582	2.8883	4.0221
W-statistic **40.445**	16.8653	23.291	14.4413	20.1105

Specifically, the value of 8.08 of the F-statistic, is above the upper bound of 4.65 at the 5% level of significance whereas the value of 40.44 of the W-statistic is above the upper bound of 23.29 at the 5% level of significance. Therefore, the null hypothesis of no cointegration among NPLs, long-term Government bond rate (LTGB), capital to assets ratio (CAP), return on equity (ROE), credit volume (CRED) and the recent GFC (D08) is rejected. All the above mentioned explanatory variables affect NPLs in the Spanish banking system, in the long-run, at 1% level of significance and bear the correct sign: an increase in the long-term Government bond rate (LTGB) is associated to more tension in the Spanish banking system and therefore higher NPLs, higher returns on equity for the Spanish banks cause a greater stock of NPLs whereas an expansion in credit (CRED) is associated to higher NPLS in the future. On the other hand, well capitalized banks seem to report higher NPLs in Spain considering the highly significant negative effect of capital to assets ratio (CAP) on the NPLs. The dummy (D08) that captures the effect of the GFC (and partially of the debt crisis) on the impaired loans in Spain is significant and bears a positive sign. It is worth noting that, results of the unit roots with a structural break tests suggested that a break exists in the NPLs, in the third quarter of the year 2010. The dummy created to capture this break was not significant and as such was dropped from the model. However, it may be assumed that as such period coincides with the outbreak of the sovereign debt turbulence in the Euro area, its effect is already captured by the dummy (D08) and the 10-year Government bond rate whose coefficient is positive and significant. The long-run estimates suggested by the ARDL approach (t-statistics in parentheses) are presented in equation (13) below:

$$NPL = -0.5 + 0.75\ LTGB^{***} + 1.71\ CAP^{***} + 0.5\ ROE^{***} + 0.01\ CRED^{***} + 0.04\ D08^{***} \qquad \textbf{(13)}$$
$$(3.93) \quad (2.7) \qquad (14.9) \qquad (3.22) \qquad (2.85) \qquad (4.95)$$

Where *, ** and *** denote 10%, 5% and 1% level of significance.

Table 22. The ECM of the ARDL (1, 0, 0, 1, 0) regression for Spain

Regressor	Coefficient	t-ratio
ΔLTGB	0.117	3.622
ΔCAP	0.267	5.612
ΔROE	0.050	4.204
ΔCRED	0.002	2.773
ΔD08	0.006	6.811
ECT $_{t-1}$	-0.156	-4.759
R^2=0.734; $F(6,65)$= 29.49		

Lastly, the error correction version of the ARDL equation is estimated in order to determine the speed of adjustment of the NPLs to its long-run equilibrium value. Table 22 outlines the results of the Error Correction Model (ECM) where the ECT is negative and significant. Estimated at -0.15, it shows that around 15% of deviation of the NPLs ratio from its equilibrium in the previous quarter gets corrected in the current one.

As observed in Table 23, the diagnostic tests confirm that the underlying ARDL model exhibits no problems of serial correlation or functional form but there is evidence of heteroskedasticity, an issue which is solved through the use of White's (1980) adjusted standard errors.

Table 23. Diagnostic Tests for the Spanish ARDL (1, 0, 0, 1, 0) model

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ(4)= 6.4540 [.168]	F(4, 60)= 1.4770 [.220]
B: Functional Form	CHSQ(1)= 1.2394 [.266]	F(1, 63)= 1.1035 [.298]
C: Heteroskedasticity	CHSQ(1)= 4.4623 [.035]	F(1, 70)= 4.6250 [.035]

In order to verify the validity of the ARDL findings is proceeded with the Johansen (1988) and Johansen and Juselius (1990) cointegration test. Firstly, the order of lags is determined, by estimating a regular VAR model starting with maximum of four lags and then reducing it to one, the number of lags chosen by most of the criteria (See Table C3 in Appendix C).

As reported in Table 24, according to both the Trace statistic and the Maximal Eigenvalue statistic there exists one cointegrating vector among the variables.

Table 24. Summary results from the Johansen cointegration test for Spain*

Trace test				
No. of CE(s)	Eigenvalue	Trace stat	0.05 critical value	Probability***
None**	0.44996	82.0065	60.0614	0.0003
At most 1	0.26626	40.16188	40.1749	0.00502
Maximum eigenvalue				
No. of CE(s)	Eigenvalue	Max-eigen stat	0.05 critical value	Probability***
None**	0.44996	41.8446	30.43961	0.0013
At most 1	0.26626	21.6720	24.15921	0.1048

Note:

*based on linear deterministic trend.

** denotes rejection of the null hypothesis at the 0.05 level.

*** MacKinnon-Haug-Michelis (1999) p-values.

Considering this, a VECM estimation follows, based on a maximum number of one lag. The normalized cointegrating coefficients are presented in Table 25.

The cointegrating equation suggested by the VECM is:

$$NPL = 0.6 + 1.06\,LTGB^{***} + 1.61\,CAP^{***} + 0.98\,ROE^{***} + 0.02\,CRED^{***} + 0.005\,D08^{***} \qquad (14)$$
$$\quad\quad\quad (4.4) \quad\quad\quad (16.13) \quad\quad\quad (10.47) \quad\quad\quad (3.45) \quad\quad\quad (9.37)$$

Where *, ** and *** denote 10%, 5% and 1% level of significance.

The ECT component is negative and statistically significant; the ECT's value of -0.045 suggests that 4.5% of the disequilibrium in NPLs is offset by the short-run adjustment in the same quarter. Hence, the VECM results reinforce those derived from the ARDL model. Long-run coefficients derived by both the approaches are of high significance (1%) and bear exactly the same sign.

Table 25. VECM results for Spain

Normalized cointegrating coefficients (t-statistics in parentheses)					
NPL	LTGB	CAP	ROE	CRED	D08
1.000000	-1.061512	-0.01613	-0.981659	-0.023308	0.005871
	(-4.40391)	(-16.1307)	(-10.4771)	(-3.45697)	(9.37561)
ECT	-0.04574				
	(-3.46802)				
R-squared	0.56				
Adj. R-squared	0.54				
Akaike AIC	-9.26				
Schwarz SC	-9.17				
F-statistic	46.98				

Overall, findings for Spain suggest that NPLs in the Spanish banking system are affected by bank-specific factors and idiosyncratic vulnerabilities such as, the country's high indebtedness. These findings are in line with some of the results derived from similar studies that investigate credit risk in a group of countries, where Spain is included (Messai and Jouini, 2013; Castro, 2013) as well as with some of the results achieved by studies performed for Spain (Salas and Saurina 2002; Blanco and Gimeno 2012).

The Spanish long-term government bond yield (LTGB) has a positive effect on credit risk and therefore it is confirmed that there is a tight relation between sovereign debt and the quality of banks' loan portfolio. To our knowledge, such effect has not been previously investigated by the existing studies that focus exclusively in the Spanish banking system. It is worth mentioning though, that Makri et al. (2014) have provided evidence of a positive significant effect of public debt on the NPLs of 14 countries of the Eurozone (including Spain) over the period 2000-2008. Given this and the fact that similar studies performed for other countries such as the ones by Quagliariello (2004), Albertazzi et al. (2013) for Italy and the study by Louzis et al. (2012) for Greece, have provided evidence that long-term government bond yields in highly indebted countries affect credit risk, our results are reasonable and support the argument that debt crises and banking crises are tightly related.

Credit has the expected positive effect on credit risk in the case of Spain and confirms the commonly agreed theory that generous lending is associated with a relaxation of loans' terms and conditions that lead to increases in loans' delinquencies (Keeton 1999; Ali and Daly, 2010; Nkusu 2011). Our finding is in line with the results derived from other studies performed for Spain (Salas

and Saurina 2002; Jimenez and Saurina, 2004; Blanco and Gimeno 2012). By analysing a panel of Spanish banks over various time periods (1985-1997; 1988-2000; 1984-2009) these studies conclude that excessive lending and NPLs are positively related. Moreover, such relation is also suggested by the studies of Mesai and Jouini (2013) and Castro (2013) that investigate credit risk in Spain and in the other GIPSI countries (Italy, Greece, Ireland and Portugal) and provide evidence that excessive lending accelerates bad loans.

The return on equity (ROE) is positively linked to credit risk and thus, this finding agrees with the procyclical credit policy hypothesis explained by Louzis et al. (2012). Most profitable banks are in the meantime the riskier ones as they prefer to multiply their earnings at the expense of dealing with a deteriorated quality of their loans in the future. Our finding for Spain is in agreement with the study by Garcia-Marco and Robles-Fernandez (2008) that by investigating a panel of Spanish banks over the period 1993-2000, concluded that higher returns on equity positively affect credit risk.

As in the case of Albania and Italy, the capital to assets ratio (CAP) positively impacts NPLs. This result proves that well-capitalized banks engage in riskier and more profitable activities to counterbalance losses from uninvested funds (Koehn and Santomero, 1980; Kim and Santomero, 1988; Godlewski, 2006; Makri et al., 2014; Chiorazzo et al., 2014, Gila-Gourgoura and Nikolaidou, 2017). Our finding though, contradicts the one suggested by the study of Salas and Saurina (2002), according to which a negative relationship exists between capital to assets ratio and NPLs of Spanish banks. Still, one should note that the time period analyzed by Salas and Saurina (2002), is quite distant (1985-1997) and data is collected by the banks' annual reports, recorded at a time when the Spanish banking system was going through various structural changes such as domestic and cross-border mergers and acquisitions (See Chapter 3). Thus, data accuracy may be questioned in the Salas and Saurina (2002) study. A more recent study for Spain, performed by Martin-Oliver et al (2012) for a panel of banks over the 1992-2007 period, has provided evidence that the better capitalized a bank is the higher will be the cost of its loans. Certainly, an increase in the debt burden will negatively impact the borrowers' ability to repay their loans thus, it may be assumed that higher capital ratios increase credit risk.

5.3.3 Impulse Response Analysis for Spain

In the case of Spain, the impulse response analysis (presented in Figure D3 in the Appendix D) describes how NPL reacts to shocks to its explanatory variables: the Spanish Long-term Government bond rate (LTGB), return on equity (ROE), capital to assets ratio (CAP) and credit volume (CRED).

Specifically, the first graph shows that a shock to LTGB rapidly increases NPL, which remains in the positive region during all the periods. According to the second graph, a shock to CAP rapidly increases NPL, which remains in the positive region during all the periods. The third graph shows that initially, a shock to ROE does not have a noticeable impact on NPL during the first two periods but it is associated by an increase on NPL later. Lastly, according to the fourth graph, the NPL's response to a shock to CRED is a rapid increase during periods 1 and 2, followed later by a steady value till the end of the periods.

Overall, the Spanish impulse response analysis mostly agrees with the cointegration analysis' results as it indicates that shocks to LTGB, CAP, CRED and ROE will positively affect NPL both in the short - and in the long- run .

5.4 Turkey

5.4.1 Unit root tests results

Finally, in the case of Turkey, both the ADF and the PP tests results suggest that all series are integrated of order zero and one. Both the Perron (1997) and the Andrew and Zivot (1992) tests detect the existence of a structural break on 2003Q3. As previously mentioned, the year 2001 was considered one of the worst times in the Turkish banking system, whose recovery only initiated in the year 2003. Considering this, a dummy variable is created which takes the value 1 over the period 2001Q1- 2003Q3. Moreover, the effect of the recent GFC is captured through another dummy variable which takes the value of 1 in the third quarter of the year 2008 and on.

5.4.2 Model selection process for Turkey

As in the cases of Albania, Italy and Spain, having established the order of integration of variables, the next step of the empirical work for Turkey concerns determining the model that best describes credit risk in the Turkish banking system. Based on the existing empirical work on Turkey and the variables mostly analyzed in it, a general model (comprised of five independent variables) is constructed that includes macroeconomic variables such as the real GDP, M2 and the real effective exchange rate (REER) as well as bank-specific variables such the capital to assets ratio (CAP) and the return on equity (ROE). Apart from the common variables, idiosyncratic (country-specific) variables that are considered highly-relevant to credit risk in Turkey are incorporated in the model. Given the significant role that Turkey plays in the international markets as one of the biggest producers and traders of the world, a variety of indicators from financial markets are considered in the investigation. Specifically, the Borsa Istanbul (BIST) Gold index and the market volatility index (VIX) are considered idiosyncratic variables, highly-relevant to the Turkish credit risk. As in the

cases of Albania, Italy and Spain, after various specification searches (i.e. Wald test of coefficient restrictions), variables found not to possess any meaningful additional information are discarded from the final model. As a result, the equation that best describes the determinants of credit risk in the Turkish banking system is as follows:

$$NPL = f\,(NPL_{-t},\ BISTGI,\ REER,\ VIX,\ D03) \tag{15}$$

Where:

NPL - the ratio of non-performing loans to total loans,

NPL_{-t} - the lagged value of NPL,

BISTGI - the Borsa Istanbul (BIST) Gold index,

REER - the real effective exchange rate,

VIX - the market volatility index and

D03 - the dummy created in accordance to the unit root with structural break tests, and captures the 2001 financial crisis in Turkey until recovery started (2001Q1-2003Q3).

5.4.3 Cointegration analysis for Turkey

Having established the model that best explains the NPLs ratio in Turkey, the next step of the empirical work for Turkey consists of testing for cointegration through the bounds test. According to the Schwarz - Bayesian Criterion, an ARDL (1,0,4,0) is selected. The bounds testing methodology of Pesaran et al (2001), confirms the existence of the long-run relationship among the above mentioned cointegrated variables. As observed in Table 26, the F-statistic of 13.18 and the W-statistic of 57.72 are above the upper bounds of 4.95 and 19.81 respectively at the 5% significance level. Therefore, the null hypothesis of no cointegration among NPLs, the BIST Gold index (BISTGI), the real effective exchange rate (REER), market volatility index (VIX), and the dummy D03 can be rejected.

Table 26. The bounds testing results for Turkey

test-statistic	5%		10%	
	Lower bound	Upper bound	Lower bound	Upper bound
F-statistic **13.1820**	3.6919	4.9538	3.0483	4.2582
W-statistic **52.7279**	14.7617	19.8153	12.1931	17.0328

Results from the long-run relation suggest that all the above mentioned variables are significant in the long-run at the 5% and 1% level of significance and bear the expected sign, reported in Table

27. The BIST Gold index (BISTGI) has the expected negative effect on the non-performing loans implying that as the gold market performs better the quality of loans in the Turkish banking system improves. The real effective exchange rate also has a negative effect on credit risk implying that as the local currency depreciates the quality of loans in the Turkish banking system deteriorates. The market volatility index (VIX) has a significant positive effect in the long-run implying that potential fear in the market causes an increase in bad loans. The dummy that captures the period of financial distress in Turkey has the expected positive effect on the NPLs. It should be noted that, the dummy that accounts for the effect of the GFC resulted insignificant to credit risk and as such was dropped from the model. Considering though, that the indicator of financial distress in the market (VIX) affects credit risk in Turkey, it may be assumed that it incorporates also an indirect effect of the GFC.

The long-run estimates suggested by the ARDL approach (t-statistics in parentheses) are given in equation (16) below:

$$NPL= 0.29 - 0.0001BISTGI*** - 0.002REER*** + 0.001VIX*** + 0.12D03*** \qquad (16)$$

$$\quad (4.95) \qquad (4.74) \qquad\qquad (3.64) \qquad\quad (3) \qquad\quad (9.02)$$

Where *, ** and *** denote 10%, 5% and 1% level of significance.

As observed in the error correction model presented in Table 27, the error correction term (ECT) is highly significant and bears the correct sign. Estimated at -0.52, the ECT suggests that around 52% of deviation of the flow of the new bad loans ratio from its equilibrium in the previous quarter gets corrected in the current one.

Table 27. The ECM of the ARDL (1,0,4,0) regression for Turkey

Regressor	Coefficient	t-ratio
ΔBISTGI	-0.0001	-3.8726
ΔREER	-0.0001	-2.3592
ΔREER1	0.0001	2.5946
ΔREER2	0.0001	3.0052
ΔREER3	0.0001	3.0560
ΔVIX	0.0001	2.8988
ΔD03	0.0648	6.1019
ECT $_{t\text{-}1}$	-0.5188	-7.5407
R^2=0.53; $F(8,60)$= 8.2681		

The estimated ARDL model for Turkey passes all the diagnostic tests with the exception of heteroskedasticity, reported in Table 28. Therefore standard errors are adjusted through the use of White's (1980) heteroskedasticity-corrected standard error.

Table 28. Diagnostic Tests for the Turkish ARDL (1,0,4,0) model

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ(4)= 3.5634 [.468]	F(4, 55)= 0.7487 [.563]
B: Functional Form	CHSQ(1)= 0.0001 [.982]	F(1, 58)= 0.0001 [.983]
C: Heteroskedasticity	CHSQ(1)= 17.944 [.000]	F(1, 67)= 23.548 [.000]

The results of the ARDL model are crosschecked by applying the Johansen (1988) and Johansen and Juselius (1990) cointegration test. As in the case of Albania, Italy and Spain, firstly a regular vector autoregressive (VAR) model is estimated and according to the lag length selection criteria, the number of two lags is selected as the appropriate one while testing for cointegration (See Table C4 in Appendix C). Results reported in Table 29, suggest that there exists one cointegrating vector among NPL, BISTGI, REER and VIX, at the 5% level of significance.

Table 29. Summary results from the Johansen cointegration test for Turkey*

Trace test				
No. of CE(s)	Eigenvalue	Trace stat	0.05 critical value	Probability***
None**	0.412070	55.76565	47.85613	0.0076
At most 1	0.155952	18.58531	29.79707	0.5230
Maximum eigenvalue				
No. of CE(s)	Eigenvalue	Max-eigen stat	0.05 critical value	Probability***
None**	0.412070	37.18034	27.58434	0.0022
At most 1	0.155952	11.86823	21.13162	0.5607

Note:

*based on linear deterministic trend.

** denotes rejection of the null hypothesis at the 0.05 level.

*** MacKinnon-Haug-Michelis (1999) p-values.

Considering this, the VECM is estimated using two lags and the normalized cointegrating coefficients are presented in Table 30. All the coefficients are significant and bear the expected sign. The cointegrating equation suggested by the VECM is:

$$NPL= 0.31 – 0.0001BISTGI*** - 0.002REER***+ 0.002\ VIX*** + 0.04D03*** \qquad \textbf{(17)}$$

$$(5.28) \qquad\qquad (4.1) \qquad\qquad (4.03) \qquad\qquad (4.93)$$

Where (***), (**) and (*) denote 10%, 5% and 1% level of significance.

As observed above, a strong negative relationship exists between NPL, the BIST Gold index (BISTGI) and the real effective exchange rate (REER) whereas a positive link exists between NPL, the market volatility index (VIX) and the dummy capturing the 2001 financial crisis in Turkey (D03). The ECT component has the correct negative sign (-0.39) suggesting that 39% of the disequilibrium in NPLs is offset by the short-run adjustment in the same quarter. It is evident that the VECM results comply with those derived from the ARDL model; long-run coefficients derived by both the approaches are of high significance (1%) and bear exactly the same sign.

Table 30. VECM results for Turkey

Normalized cointegrating coefficients (t-ratios in parentheses)				
NPL	BISTGI	REER	VIX	D03
1.000000	0.0001	0.0023	-0.0025	0.0429
	(5.287)	(4.1057)	(-4.0393)	(4.932)
ECT	-0.3931			
	(**-6.0148**)			
R-squared	0.44			
Adj. R-squared	0.34			
Akaike AIC	-5.13			
Schwarz SC	-4.78			
F-statistic	4.58			

Overall, empirical results for Turkey provide evidence that the quality of Turkish banks' loans is closely related to macroeconomic factors such as the real effective exchange rate (REER) as well as to financial markets indicators such as the BIST Gold index (BISTGI) and the CBOE market volatility index (VIX).

The real effective exchange rate (REER) has a negative effect on credit risk in Turkey implying that as local currency (Turkish lira) depreciates the quality of loans worsens. This result is in agreement with those theoretical considerations on credit risk that attribute the negative impact of the exchange rate depreciation to the existence of a high degree of foreign currency loans in banks'

portfolios (Nkusu, 2011; Beck et al., 2013). Moreover, the study by Us (2017) has provided evidence that an appreciation of the foreign exchange rate accelerates NPLs in Turkey and therefore the finding of this research reinforces the importance of a strong local currency to the quality of loans in the Turkish banking system and is highly relevant to the current crisis in the country. Turkey is the case of a widespread foreign currency lending[39] and the recent economic and financial developments such as the rapid lira depreciation, slow economic growth and the jump in the NPLs ratio in the end of year 2018[40] recall further attention of the policymakers on bank foreign lending and the hedge associated to it.

The BIST Gold index (BISTGI) has a negative impact on credit risk, implying that higher returns of gold transactions in the BIST Precious Metals market are associated to a lower credit risk in Turkey. Given that Turkey is a producer and big trader of gold, it sounds reasonable that a good performance of gold in the precious metals market is associated to an improved quality of the Turkish banks' loan portfolios. Besides, the relevance of gold to the Turkish economy has further increased recently as in response to the depreciated Turkish lira, consumers switched to the precious metal and gold imports to Turkey increased eightfold last December (CBRT, 2019). This finding is new in the existing literature that has focused on the credit risk determinants in Turkey. However, the study of Yurdakul (2014) has provided similar results that present an inverse relationship between a financial market performance and credit risk in Turkey. Specifically, this study has provided evidence that the Istanbul Stock exchange market index is negatively related to credit risk.

The market volatility index (VIX) has a significant positive effect on the NPLs in Turkey, implying that sudden changes in uncertainty as proxied by jumps in the VIX index cause an increase in problem loans. This finding is new in the existing literature that investigates credit risk in Turkey since the existing studies performed by Vatansever and Hepsen (2013), Yurdakul (2014) and Us (2017) have not considered this indicator as a potential credit risk driver. Given the rising economic, political and social tensions in Turkey, uncertainty in the market is expected to rise and therefore the future of loans' quality in the Turkish banking system is at risk.

5.4.3 Impulse Response Analysis for Turkey

As in the cases of Albania, Italy and Spain, the Turkish impulse response analysis (presented in Figure D4 in the Appendix D) quantifies the response of NPL to shocks to its explanatory variables: the Borsa Istanbul gold index (BISTGI), the real effective exchange rate (REER) the market

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[39] Turkish banks are well-known for the high degree of foreign-currency landing (ranging from 55% of the total loans in 2002 in 28% in the year 2010) and despite the fact that the latter was banned for consumer loans in 2009, corporations were still allowed to borrow in foreign currency provided that the maturity of the loan is more than a year and the amount financed is more than 5 million US dollar (Kutan et al, 2012).

[40] According to CBRT (2019) Stability report, NPLs ratio in Turkey increased from 2.7% in the end of October to 4% as of end of December 2018.

volatility index (VIX). According to the first two graphs, NPL decreases as a result of a one standard deviation shock in BISTGI and REER. In contrast, the last graph indicates that a shock to VIX is associated to an increase in NPL. The Turkish impulse response analysis indicates that all the above variables significantly affect NPLs in the Turkish banking system in the directions suggested by the two empirical approaches employed in this research. That is, shocks to BISTGI and REER will have a negative impact on NPL, whereas shocks to VIX will have the adverse (positive) impact.

5.5 Conclusions

This chapter provided empirical evidence on the determinants of credit risk in four European countries, namely: Albania, Italy, Spain and Turkey. The key objective was to focus on a diverse dataset of potential influencers of credit risk and through the use of two distinctive econometric techniques, to uncover those factors that matter to loans' quality in each focal country.

The estimation process was based on the cointegration analysis, specifically, the ARDL approach to cointegration and the Johansen cointegration test (VECM). The novelty of this research lies in the estimation of the ARDL model, which according to the author's knowledge, has not been previously used in the existing empirical work for Albania, Italy, Spain and Turkey. The advantage of being able to determine both the short and the long-run relation between the variables involved (through the ECM), identifies the ARDL approach as a comprehensive tool in credit risk modeling.

The estimation route started with determining the order of integration of the variables through the unit root tests (PP and AZ) as well as tests that account for the presence of structural breaks. Particularly, the latters provided useful insights on the events occurred within the investigated timeline that have caused shifts in data.

Afterwards, the model that best explains credit risk in each country was determined and the cointegration relationship was established through the use of the ARDL and the VECM approaches, two cointegrating techniques that complement each-other. Both the approaches agreed on the determinants of credit risk in each country. Apart from suggesting similarities on the factors that affect credit risk in each country (i.e. the positive effect of the European debt crisis risk in Albania, Italy and Spain), findings witnessed diversity among the significant explanatory variables and therefore emphasized the critical role of idiosyncratic factors on the quality of loans in the respective banking systems. For example, despite the fact that public debt plays an important role on both the Italian and the Spanish credit risk, the latter appears to be sensitive also to a number of

banking sector characteristics whereas in the case of Italy, the effect of the Italian banking-industry on credit risk is weaker.

Finally, the impulse response analysis gave the effect that shocks in the explanatory variables have on credit risk in each country. The graphs confirmed the results achieved by the cointegration techniques.

The next chapter provides a comprehensive review of the findings for each country by highlighting the diversity of results even among similar countries.

Chapter 6: Comprehensive summary of the empirical results and their variation among the focal countries

Introduction

The empirical findings in the previous chapter revealed that, the idiosyncratic features of each country play an important role in bank lending quality. Although the focal countries of this research can be grouped in two categories according to their income level: high-income (Italy and Spain) and upper middle-income (Albania and Turkey)[41], findings support the view that their financial stability is not affected by the same factors, even for countries in the same group. To this extent, the aim of this chapter is to compare the empirical findings on the four focal countries, paying particular attention to the ones that fit the same income category so that a more complete view on the vulnerability of the financial systems can be provided. Section 6.1 summarizes and compares the empirical findings whereas conclusions are provided in Section 6.2.

6.1 Comparison of results for Albania, Italy, Spain and Turkey.

Prior to focusing on the array of empirical findings among the focal countries, it is worth staring with a comparative eye at the evolution of some of their key economic indicators, over the time period of the empirical investigation. Such analysis will highlight the dissimilarities between the focal countries and therefore provide answer to the third research question presented on Chapter 1 "How do findings differ among countries that are found at different stages of economic and financial development and how important are country-specific features on this matter?"

Table 6.1 outlines the average values of several key economic indicators of Albania, Italy, Spain and Turkey over the time periods 1998-2007 and 2008-2016. Given that the years 2008 and 2009 coincide with the burst and spread of the GFC whereas the years 2010, 2011 and 2012 mark the onset of the European sovereign debt crisis, figures for these years are disclosed separately to provide a clear view of what happened in each country's economy as the GFC and the debt crisis unfolded. Figure 31 displays the evolution of the NPLs ratio of each country over the 2005[42]-2016 timeframe.

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[41] World Bank classification as of July 2019
[42] Yearly data on NPLs are available on the World Bank's website, starting from year 2005.

Table 31. Key economic indicators for Albania, Italy, Spain and Turkey

		1998-2007	2008	2009	2010	2011	2012	2008-2016
Albania	GDP per capita (current USD)	2126	4370	4114	4094	4437	4247	4259
	GDP growth (annual %)	7	7.5	3.3	3.7	2.5	1.4	2.9
	Unemployment (%)	19.9	13	13.8	14.2	14	13.4	14.9
	Investment (% of GDP)	33.6	33.9	32.7	28.4	29.4	26.5	27.8
	Public debt (% of GDP)	61.1	55.1	59.7	57.7	59.4	62.1	64.6
Italy	GDP per capita (current USD)	26846	40640	36976	35849	38334	34814	35375
	GDP growth (annual %)	1.4	-1	-5.4	1.6	0.6	-2.8	-0.5
	Unemployment (%)	9.3	6.7	7.7	8.4	8.4	10.6	9
	Investment (% of GDP)	20.5	21.2	20	19.9	19.6	18.3	18.5
	Public debt (% of GDP)	104.6	102.4	112.5	115.4	116.5	123.3	121.6
Spain	GDP per capita (current USD)	21215	35579	32334	30736	31835	28563	30035
	GDP growth (annual %)	3.9	1.1	-3.5	0.01	-0.9	-2.9	-0.5
	Unemployment (%)	12.6	11.2	17.9	19.9	21.4	24.8	20.8
	Investment (% of GDP)	13.4	29.2	24.3	23	21.5	19.8	21.7
	Public debt (% of GDP)	51	39.4	52.7	60.1	70	85.4	77.6
Turkey	GDP per capita (current USD)	5559	10854	9038	10672	11335	11707	11110
	GDP growth (annual %)	4.3	0.8	-4.7	8.4	11	4.8	4.7
	Unemployment (%)	8.7	9.7	12.5	10.7	8.8	8.1	9.9
	Investment (% of GDP)	23.6	26.8	22.4	24.9	28	27.3	27.3
	Public debt (% of GDP)	53.7	40	46	42.3	39.1	36.1	43

Source: IMF, World Bank

Albania was on a rapid growth during the years 1998-2007, the highest among the four focal countries, characterized by increased flows of foreign direct investment in the country's economy and banking system whereas Italy and Spain were on a moderate growth, associated by a decrease in the unemployment rates and a rise in investments. As for Turkey, the severe economic and financial crisis of 2001 led to a considerable downturn of the economy[43]. However, the stabilization of the Turkish lira and the structural reforms in both the economic and financial sector created a suitable environment for growth from 2002 and on.

Figures displayed in Table 31 depict problematic unemployment rates in Albania and Spain over the pre-crisis period whereas Italy's average public debt ratio has been extremely high, at 104.6% of GDP, indicating that Italy's excessive indebtedness is a legacy and the likeliness for a default on its debt was already high, prior to the debt crises initiation. As displayed in Figure 10, the quality of bank lending prior to the GFC was satisfactory for all the focal countries given the low NPL ratios during the years 2005, 2006 and 2007.

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[43] During 2001, the Turkish lira lost one-third of its value against the dollar, the economy shrunk by 6% whereas unemployment rose to 19% (See Chapter 3).

Figure 10. NPLs ratio in Albania, Italy, Spain and Turkey; 2005-2016
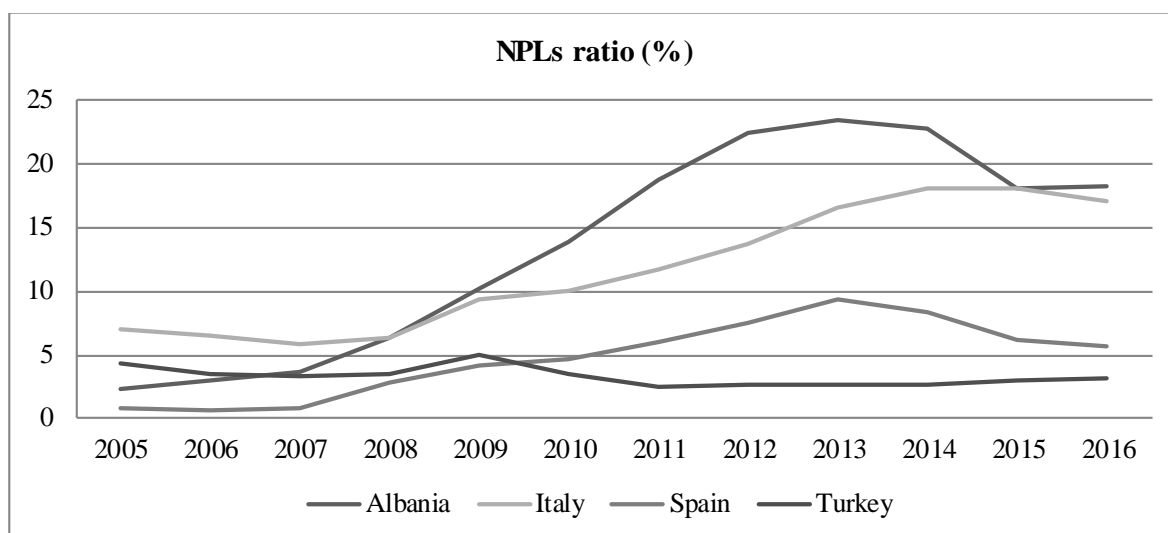
Source: IMF

As the GFC spread though, problems started to surface in Italy and Spain. Growth contracted severely in both countries, from an average of 1.4% over the period 1998-2007 to -1% and -5.4% in the years 2008 and 2009 in the case of Italy and from an average of 3.9% over the period 1998-2007 to 1.1% and -3.5% in the years 2008 and 2009 in the case of Spain. Italy's crisis was pretty bad, manifested in the slowdown of the economic activity, the rise in unemployment and the jump in the NPLs ratio from 5.7% in the year 2007 to 6.2% and 9.4% in the years 2008 and 2009 (See Figure 6.1). Spain's crisis was similarly bad given the burst of the housing bubble that was responsible for much of the economic growth of the country and that was associated to rising unemployment and increasing mortgage defaults (See details in Chapter 3). Despite not being directly involved in the financial turbulence created by the GFC, Albania also felt its burden during the years 2009-2010 since GDP growth decreased from 7.5% in the year 2008 to 3.3% and 3.7% in the years 2009 and 2010. The economic contraction was associated by a reduction of remittances and investments whereas NPLs started to increase progressively, far exceeding those reported by the Italian and Spanish banking systems, which were more "directly" exposed to the crisis (See Figure 10).

In contrast to Albania, Italy and Spain, Turkey's economy only felt turbulence during the time frame 2008-2009. More precisely, its growth rate decreased from an average of 4.3% during the period 1998-2007 to 0.8% and -4.9% in the years 2008 and 2009. As displayed in Table 31, the successive years were characterized by positive growth rates and an increase in investments, lower unemployment, low level of public debt (among the lowest in Europe) and most important, low NPLs. Owing to the lessons learnt from the 2001 crisis, Turkey's economy entered the recovery path in the successive years and along with the good work done to increase employment, boost

investment and decrease public debt, structural reforms were also undertaken in the Turkish banking system (See details in Chapter 3). Given this, Turkey is the only country among the four focal ones that did not experience severe growth contraction and a substantial increase on the NPLs ratio in the aftermath of the GFC. This was not the case for Albania, Italy and Spain though.

Two years following the GFC, in 2010, when Greece declared that it would default on its debt, the sovereign debt crisis started in Europe, an episode where Italy and Spain have been deeply involved in due to their excessive levels of public debt. Whilst Italy already had an extreme level of sovereign debt at that time, Spain's indebtedness started to increase rapidly only in the aftermath of the GFC, due to the economic downturn and the increased vulnerability of the Spanish banking system after the burst of the housing bubble (See Table 31). As a result, the years 2010-2012 were characterized by considerable growth contraction. Specifically, GDP growth was at 1.6% 0.6% and -2.8% in the years 2010, 2011 and 2012 in the case of Italy and at 0.01% -0.9% and -2.9% in the case of Spain. Moreover, increased unemployment (especially in Spain) and higher NPLs ratios were reported by Italian and Spanish banks. Similarly, Albania's banking system continued to be tormented by a further increase on NPLs during the debt crisis period, with the NPL ratio skyrocketing to 18.7% and 22.5% in the years 2011 and 2012. As displayed in Figure 6.1, Albania and Italy kept on with the upward trend on bad loans up to the year 2016 whereas the quality of loans in Spain got better after 2013.

It becomes obvious from the displayed figures in Table 31 and from Figure 10 that since the moment the GFC unfolded in Europe till the year 2016, Albania, Italy and Spain have experienced macroeconomic imbalances manifested in slower growth, increased unemployment and a fall in investments. The negative effects were particularly harsh in Italy and Spain since the countries experienced a second crisis and were at the edge of a default on their public debt while their banking systems had to deal with a constant increase of NPLs, over the time frame 2008-2016. Although not being directly involved in the two consecutive crises, Albania's banking system was considerably negatively affected by both turbulences and joined Italy and Spain in dealing with an increased NPLs stock, which in the case of Albania was unreasonably high. In contrast, Turkey managed to successfully avoid any contagious effect from the two consecutive crises that emerged in Europe given that its economy and banking system have performed well over the last decade. However, according to the CBRT (2019) Stability report, the eruption of the Turkish lira crisis in the year 2016 has brought with it unpleasant episodes for Turkey such as growth contraction (from 7.4% in the year 2017 to 2.5% as of end of year 2018) and an increase in the NPLs ratio (from to 3% in the year 2018 to 5% in the third quarter of the year 2019).

Therefore, the addressed idiosyncratic features that affect credit risk in each country, provide important implications for policymakers not only in the countries that have encountered considerable loan losses such as Albania, Italy and Spain but also in the case of Turkey that is at the edge of another domestic crisis, ready to erupt. The empirical findings for each country, according to the ARDL and VECM approach are summarized in Table 32.

At a first glance, it becomes obvious that findings for all the countries are in broad consensus with the theoretical literature that postulates that credit risk is sensitive to variables that belong to the macroeconomic, the financial and the banking-industry environment. Still, the investigation performed for each country highlights that despite several similarities among the findings, credit risk is also driven by country-specific features.

Table 32. Summary of empirical findings

Methodology	Country			
	Albania	**Italy**	**Spain**	**Turkey**
ARDL and VECM	M1 (-), Italian sovereign debt crisis risk spread (+), capital to assets ratio (+), the initiation of financial innovation in the country (-)	Sovereign debt crisis risk spread (+), capital to assets ratio (+), VIX (+)	Long term Spanish government bond rate (+), return on equity (+), capital to assets ratio (+), credit volume (+), global financial crisis (+)	BIST gold index (-), real effective exchange rate (-), VIX (+), financial crisis of the year 2001 (+)

As observed in Table 32, results from both the ARDL and the VECM approaches for Albania, suggest that the NPLs ratio is positively affected by the Italian sovereign debt crisis risk spread (ITSPREAD) and the capital to assets ratio (CAP) whereas the effect of money supply (M1) and the dummy that captures the initiation of financial innovation in Albania (D01) is negative. All variables' impact is statistically significant both in the short and in the long run. These results are new, as the previous empirical studies that investigate credit risk in Albania have provided evidence on other variables that affect NPLs[44]. As previously mentioned in Chapters 2 and 5 though, these studies lack the employment of advanced econometric techniques and are focused on shorter time intervals compared to the one considered by this research.

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[44] Such as, GDP growth, unemployment rate, loans to assets ratio and return on equity.

In the case of Italy, results from the ARDL regression suggest that the new bad loans ratio is positively affected from the sovereign debt crisis risk spread (ITSPREAD), the capital to assets ratio (CAP) and the market volatility index (VIX). All variables affect the new bad loans ratio both in the short and in the long run except for VIX which is insignificant in the short run. The VECM results are in accordance with those derived from the ARDL model and suggest that SPREAD, CAP and VIX positively impact the new bad loans in Italy, both in the short and in the long run. Overall, these findings are in consensus with some of the results achieved by the existing empirical work performed for Italy (Quagliariello, 2004; Albertazzi et al., 2013; Chiorazzo et al., 2014; Makri et al., 2014) with the exception of the positive and significant effects of SPREAD and VIX on the new bad loans, which have not been previously investigated[45].

Results from both the ARDL model and the VECM for Spain, suggest that the NPLs ratio is positively affected from the long term government bond rate (LTGB), return on equity (ROE), credit volume (CRED), the capital to assets ratio (CAP) and the dummy created to capture the effect of the recent GFC (D08), both in the short and in the long run. The explanatory power of the sovereign debt spread comprises a brand new finding in the empirical literature that investigates credit risk in Spain. The other findings though, are in agreement with those achieved by the previous studies (Salas and Saurina 2002; Jimenez and Saurina, 2004; Blanco and Gimeno, 2012; Mesai and Jouini, 2013; Garcia-Marco and Robles-Fernandez, 2008). The only contradiction is related to the positive effect of the capital to assets ratio on credit risk, which in the study by Salas and Saurina (2002), performed for a much earlier and shorter time period (1985-1997), is found to be negative.

In the case of Turkey, both the ARDL model and the VECM results suggest that the NPLs ratio is negatively affected by the Borsa Istanbul gold index (BISTGI) and the real effective exchange rate (REER) whereas positively affected by VIX and the dummy created to capture the effect of the (2001-2003) financial crisis in Turkey (D03), both in the short and in the long run. The explanatory power of VIX on credit risk is new in the empirical literature on Turkish NPLs whereas similar results for the negative effects of the REER and the BISTGI have been achieved by existing studies (Yurdakul, 2014; Us, 2017).

The comparative analysis starts with Italy and Spain[46], two countries considered very similar in terms of their economic and financial development and non-surprisingly are mentioned together in

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[45] It is worth adding that the effect of SPREAD has been only investigated on the loan loss provisions, in the study by Albertazzi et al. (2013). Thus, to the author's knowledge, this study is the first one that investigates the impact of SPREAD (the sovereign debt crisis) on the ratio of the flow of new bad loans.

[46] Despite the fact that credit risk in Italy is measured by the ratio of new bad loans to total loans whereas in Spain by the ratio of NPLs to total loans, both the measures are considered adequate indicators of credit risk by the relevant literature (See Chapters 2 and 4) and therefore this research provides a comparison of findings between the two countries.

all debates/analyses concerning key European countries. One of the findings of this research is related to the debt burden in both the countries and in particular, the reaction of sovereign debt markets to it, captured by the spread between the Italian and the German long-term government bond yields in the case of Italy and the 10-year government bond yield in the case of Spain. In both countries, the sovereign debt risk has a significant positive effect on credit risk. A raised concern about the creditworthiness of Italy and Spain, reflected in higher sovereign debt spreads and long-term government bond yields, is associated with a higher flow of new bad debts ratio in the case of Italy and higher NPLs in the case of Spain. The plots of the Italian and Spanish long-term government bond yields (LTGB) and their spreads to the German one (SPREAD), over the investigated period (1998Q1-2016Q1), are displayed in Figure 11.

Figure 11. The long-term government bond yields of Italy and Spain and the respective spreads to the German one, 1998Q1-2016Q1.
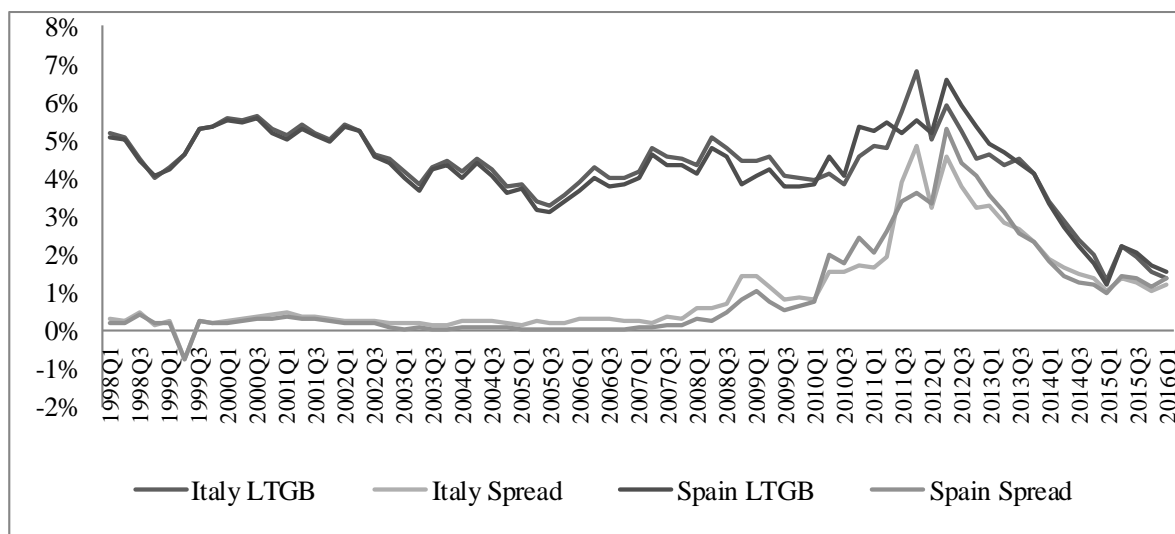
Source: ECB

The plots present a relatively stable trend on both the yields and their spreads with respect to the German yield, up to the onset of the GFC, in 2008, when an upward trend initiated on both of them. As the sovereign debt crisis started to broaden among the GIPSI countries in the year 2011[47], the yields and their respective spreads rose considerably, as a result of the fear for a break-up of the euro area. Although the decline started at the end of the year 2012, it can be seen in Figure 11 that they are still volatile and tend to rise. It can be concluded from the above findings that credit risk in Italy and Spain is positively related to the European debt crisis. One should note though, that there

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[47] "In July 2011, the differential spreads between the Italian and Spanish government bonds and the German Bund increased significantly, as Greek bonds further downgraded and the European Council announced the involvement of the private sector in the second bail-out package for Greece" (Neri, 2013).

is a crucial difference in the evolution of public debt in Italy and Spain; Table 31 depicts an already extreme level of the Italian public debt prior to the eruption of the GFC and the debt crisis whereas the Spanish public debt started to increase at the burst of the GFC. Thus, the economic and financial turbulences in Italy over the last decade are not as much related to the banking system leverage but rather to the sovereign debt burden and the habit of Italian banks to largely invest on government bonds, an event that makes them sensitive to tensions in the sovereign market (Albertazzi et al., 2013). Indeed, a positive aspect of the Italian banking system that was revealed by the GFC, has been the low levels of business and household indebtedness and the low leverage of the banking system, which continue to be below those in other European countries (IMF, 2018). In contrast, Spain witnessed an extreme demand for housing on the decade preceding the GFC, a phenomenon in which Spanish banks were key participants by excessively granting loans, as displayed in Figure 12. The abnormal increase in asset prices, particularly in the housing sector accelerated the excessive leverage by banks (Ramos-Francia et al, 2014).

Figure 12. Credit evolution in the Spanish banking system, 1998Q1-2016Q1.
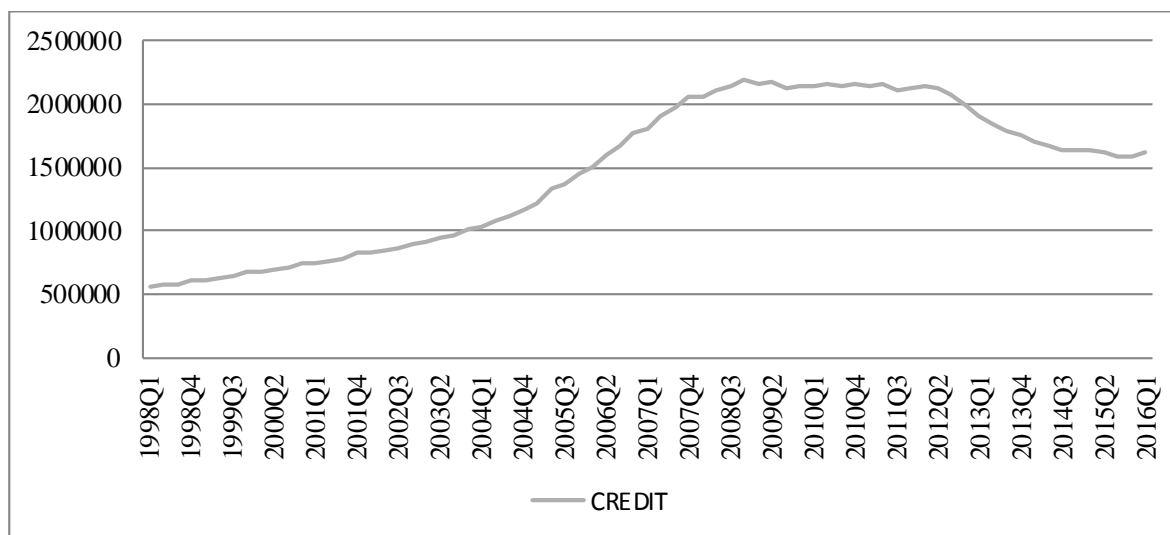
Source: Bank of Spain

Therefore, the growing imbalances that led to a rapid increase in the public debt of Spain in the aftermath of the GFC can be attributed to the indebtedness of the private sector. Against this backdrop, this research provides evidence that as credit grows in the Spanish banking system, its quality deteriorates given that the credit volume indicator positively and significantly affects NPLs in Spain.

Furthermore, results in Table 32, indicate that capital to assets ratio (CAP) is a bank-specific variable that appears to be significant to both the countries' credit risk, in the same direction. More precisely, in agreement with one strand of the theoretical literature (Koehn and Santomero, 1980;

Kim and Santomero, 1988; Makri et al., 2014; Chiorazzo et al., 2014), a higher capital to assets ratio is associated to a higher credit risk in Italy and Spain as banks that keep high levels of capital are usually engaged in high risk activities in order to improve their earnings. It becomes evident from Figure 13 though, that up to the year 2005, Spanish banks managed to keep higher capital levels than the Italian ones and as the leverage slightly increased up to the burst of the GFC, capital ratios since then have risen progressively. It may be assumed that although banks in both countries have manifested reputable capital to assets ratios, their assets composition and the higher risk associated to them, notably contribute to an increase in credit risk; Italian banks are known for their high exposure to sovereign bonds whereas Spanish banks were involved in excessive credit prior to the GFC.

Figure 13. Capital to assets ratios in the Italian and in the Spanish banking systems, 1998Q1-2016Q1.
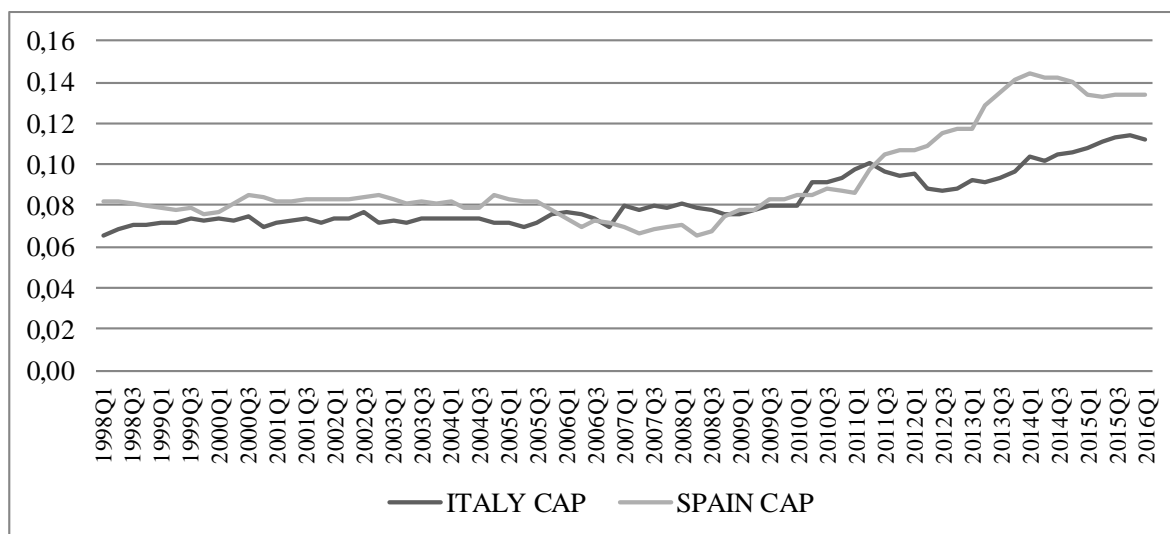
Source: Bank of Italy, Bank of Spain

Findings for Spain also suggest that as the return on equity (ROE) rises, the quality of loans deteriorates, thus, they are in line with the procyclical hypothesis according to which the most profitable banks are the riskier ones (Garcia-Marco and Robles-Fernandez, 2008; Louzis et al., 2012).

Figure 14. ROE in the Spanish banking system, 1998Q1-2016Q1
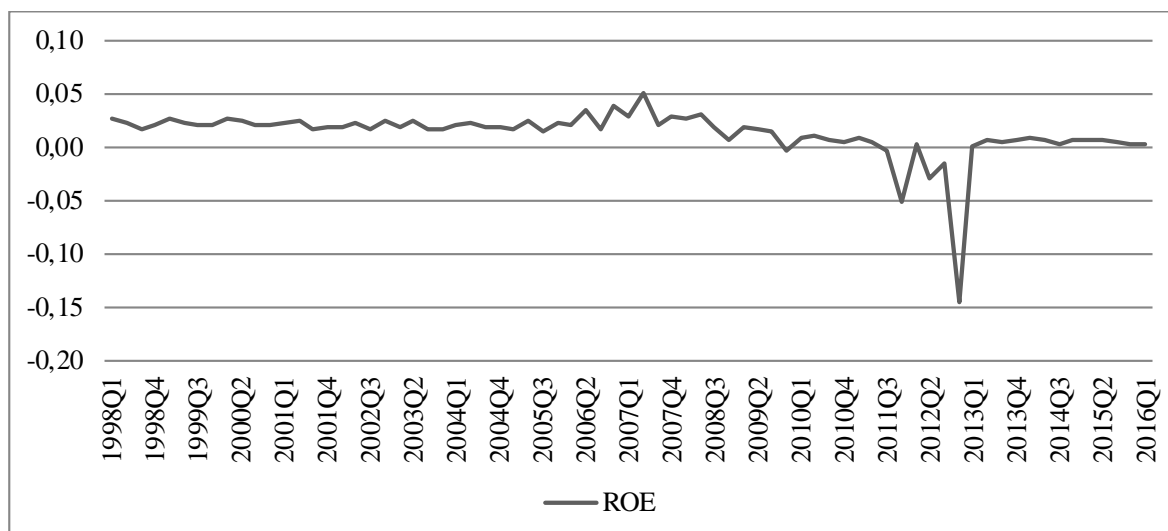
Source: Bank of Spain

Figure 14 shows that whilst Spanish banks maintained a rather stable return on their equity in the years preceding the sovereign debt crisis, they encountered loses at the burst of the latter and despite the fact that the ROE turned to positive in the year 2013, profitability still remains low.

Lastly, findings displayed in Table 32 provide evidence that credit risk in Italy and Spain is sensitive to shocks in the global financial markets, evidenced by the positive and significant coefficient of the CBOE volatility index (VIX) in the case of Italy and the GFC dummy in the case of Spain. It is worth noting though, that according to our findings the Italian banking system was shielded by the negative impacts of the recent GFC, since the dummy created to capture it was insignificant to credit risk. Indeed, De Bonis et al. (2012) highlight the limited crisis' impact on the Italian banks' activity and attribute it to their prudent lending policies and low levels of households' debt.

At the burst of the financial crisis, Italy was not in the kind of trouble of other GIPSI countries such as Spain (whose banking system started reporting high NPLs at the collapse of the real estate empire, which was massively financed by Spanish banks' loans). Still, the stock markets' expectation of volatility in the future appear to impact credit risk in Italy given that VIX has a positive significant effect on the flow of new bad loans.

As displayed in Figure 15, there have been several tensions over the time period investigated by this research, when expectations of volatility in the financial markets were quite high. Among them, the burst of the GFC (in 2008), Greece's default on its sovereign debt (in 2010) and the spread of the debt crisis among the GIPSI countries (2011) are particularly associated to a considerable fear and tension in the markets.

Figure 15. CBOE volatility index (VIX), 1998Q1-2016Q1
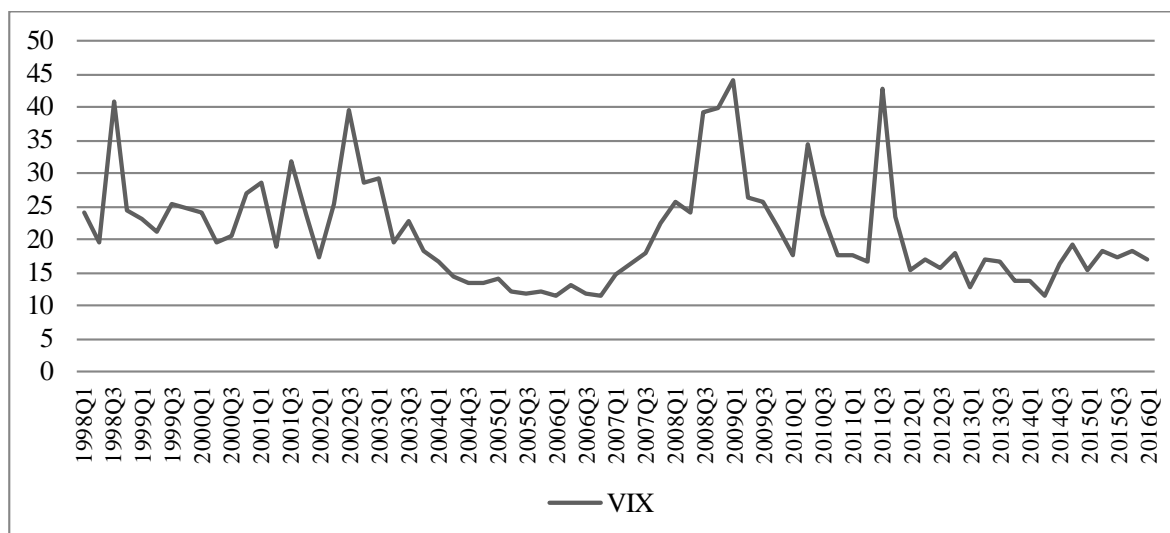
Source: ECB

In this respect, it becomes obvious that the Italian and Spanish banking systems' resiliencies are quite different, although they have been operating for years under the same roof of regulations of the Euro Area. Moreover, it may be concluded that despite the fact that Italy and Spain are placed into the same group of peripheral European (GIPSI) countries (along with Greece, Ireland and Portugal), due to their economic and financial vulnerability and the disability to refinance their government debts, the core of their problems lies in diverse shortcomings, exclusive to each country, which can only be unfolded through an individual investigation.

The comparative analysis continues with Albania and Turkey, two countries in the Balkan region that are candidates for membership in the European Union. Despite the fact that Albania and Turkey are equally classified as upper middle-income countries, Turkey is a more powerful economy, distinguished for its advanced financial system and strong international partnerships (See Chapter 3). Turkey has gained a sizeable presence in the economic activity of Western Balkans (Serbia, Kosovo, Bosnia and Herzegovina and Albania) through various investment projects, mainly in the construction sector and infrastructure. In this context, strong economic and financial ties exist between Albania and Turkey as investments from the latter have contributed to the Albanian telecommunications sector, steel-production[48] and the banking system (the second largest bank in Albania, BKT, is Turkish owned). Still, it appears that despite the strong Turkish influence and the

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[48]A Turkish company bought a share in the Albanian telecommunications company after its privatization in 2007 whereas the largest company in the steel-production field in Albania is Turkish owned.

historic interconnectedness between the two countries[49], banking activity in Albania, is more sensitive to developments in the European markets rather than to developments in Turkey.

Table 32 (page 106) displays that the Italian sovereign debt spread[50] has a positive effect on credit risk in Albania indicating that the latter is quite sensitive to the economic and financial performance of its neighbor, Italy. Since the latter is the main trading partner of Albania, a fundamental source of immigrants' remittances and Italian bank subsidiaries have a substantial presence in the Albanian banking sector (See Chapters 1 and 4), spillover effects arise from the Italian sovereign debt crisis to credit risk in Albania.

In contrast, such effects are not present in the Turkish banking system considering that sovereign debt spreads (of Italy and Spain[51]) were not significant to credit risk when included in the model. The European sovereign debt crisis did not fuel tensions among the Turkish banks as a result of a sound regulatory framework following the 2001 crisis and the weaker financial ties to Europe compared to those of Eastern, Southeastern and Central European countries (Gunes and Yildirim, 2016). Even though there is European capital presence in the Turkish banks, it is not significant enough to allow for any spillover effect to arise, as in the case of Albania. On the other hand, the significance of the dummy created to capture the effect of the 2001 crisis in Turkey reinforces the argument that the substantial reforms undertaken in the Turkish banks and the prudent regulation in the aftermath of the Turkish lira crisis, did contribute positively to their resilience to external shocks by providing a safe environment for loans.

Furthermore, results outlined in Table 32 suggest that, credit risk in Albania is negatively and significantly affected by M1 (money supply). An increase in the latter is associated to an improved quality of loans in the Albanian banking system. As observed in Figure 16, a loose monetary policy has been followed in Albania since the year 1998, as part of financial liberalization, aiming to promote growth. However, at the bursts of the GFC and the successive European sovereign crisis, there is a visible contraction on money supply which reflected the poor domestic demand for funding both from the private and public sector (Bank of Albania, 2016).

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[49] Albania was under the Ottoman Empire for a period of 500 years (1415-1912), a historic event that contributed to a mutual exchange of cultures, religion and economic and social behaviors.

[50] The Italian spread is calculated as the difference between the Italian and the German long-term government bond yields.

[51] The purpose of including the Italian and the Spanish sovereign spreads as potential credit risk influencers in Turkey, is related to the fact that as mentioned in the CBRT (2018) stability report, there is one Italian commercial bank operating the Turkish banking system whereas a Spanish bank holds half the shares of the third largest bank in Turkey.

Figure 16. Money supply (M1) in Albania, 1998Q4-2016Q1
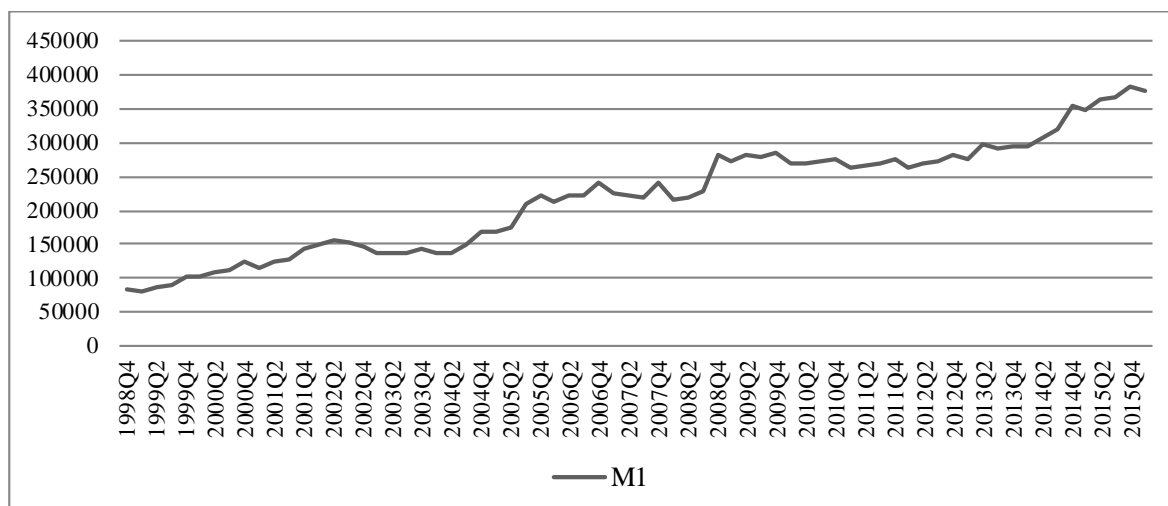
Source: Bank of Albania

Having a look at the summary of the empirical findings displayed in Table 32 , it becomes evident that whilst credit risk in Albania is affected by variables from the macroeconomic, the financial and the banking-industry environment, only macroeconomic variables and financial markets' indicators appear to play an important role on credit risk in Turkey. More precisely, the BIST gold index (BISTGI) and the real effective exchange rate (REER) negatively affect credit risk in Turkey whereas the CBOE volatility index (VIX) has a positive significant impact on NPLs. Certainly, as one of the biggest traders in the world, Turkey's economy is sensitive to events in the international markets and in particular to the fear of tension in the market (VIX). Furthermore, the BIST gold index has a negative effect on NPLs, implying that credit risk in the Turkish banking system is negatively related to the returns on gold market.

Figure 17. The Borsa Istanbul gold index (BISTGI), 1998Q4-2016Q1
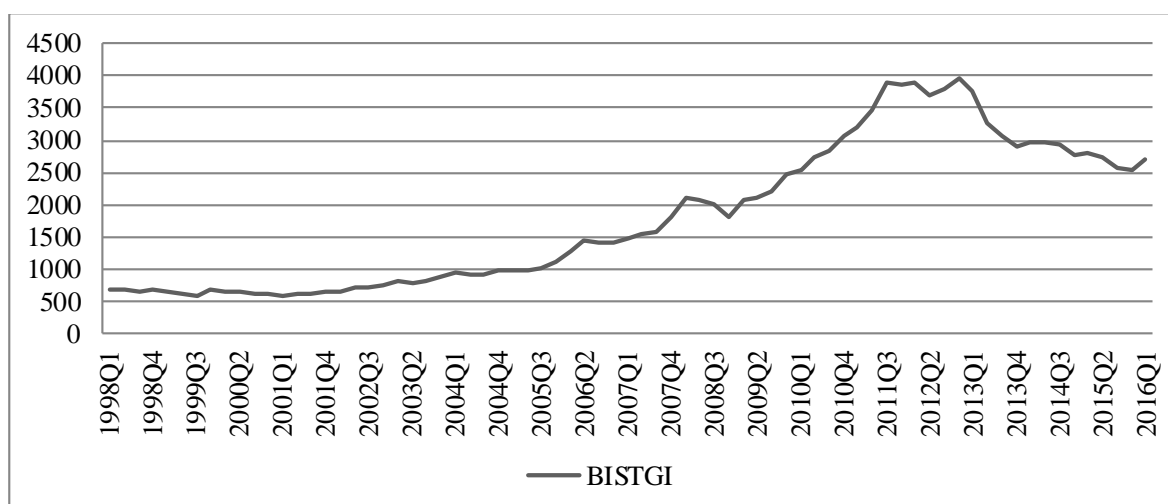
Source: CBRT

Given that Turkey is a producer and big trader of gold, it sounds reasonable that a good performance of gold in the precious metals market is associated to an improved quality of the Turkish banks' loan portfolios. Figure 17 displays that as economic recovery from the 2001 crisis started (in the end of year 2003), the gold index followed an upward trend up to the year 2011, made the all-time highs in the years 2011 and 2012 and started a downward trend afterwards. Gold price is strictly related to the dollar value and as the latter appreciates, gold becomes cheaper whereas apparently NPLs in the Turkish banking system increase.

The real effective exchange rate (REER) is a macroeconomic indicator that has a negative and significant impact on credit risk in Turkey. As the Turkish lira depreciates, the quality of loans deteriorates. Both Albania and Turkey, just like other Central, Eastern and South Eastern European countries, are distinguished for the high share of foreign currency loans in their banks' portfolios. During the economic boom (1998-2007) there was a high demand for foreign denominated loans in these countries, either because they were perceived as cheaper or because of the lost confidence in the domestic currency.

In the case of Turkey though, the ties with the foreign currencies are much stronger as the country is classified among the highly dollarized[52] countries in the world by the IMF. Despite the benefits associated to dollarization, such as closer integration in the international markets, the availability of a more complete range of assets for domestic investors and the ability to remonetize the economy when confidence in the domestic currency is lost, there are also certain risks related to it (Balino et al., 1999). Among them, is the risk of an increase on loan defaults if the domestic currency devaluates; in such case the financial position of banks deteriorates, unless foreign currency lending is largely to debtors whose net financial position benefits from devaluation, e.g. exporters. Indeed, the Turkish lira meltdown over the last five years and the deteriorated quality of loans highlighted by the CBRT (2019) Stability report[53], reinforce the negative effect of domestic currency is devalued on credit risk. Figure 18 displays the evolution of the real effective exchange rate in Turkey.

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[52] "Dollarization, the holding by residents of a significant share of their assets in the form of foreign-currency-denominated assets, is a common feature of developing countries and transition economies and is thereby typical--to a greater or lesser extent--of many countries that have IMF-supported adjustment programs" (Balino et al, 1999).
[53] NPL ratio reached 5% in the third quarter of the year 2019

Figure 18. The real effective exchange rate (REER) of Turkey, 1998Q4-2016Q1
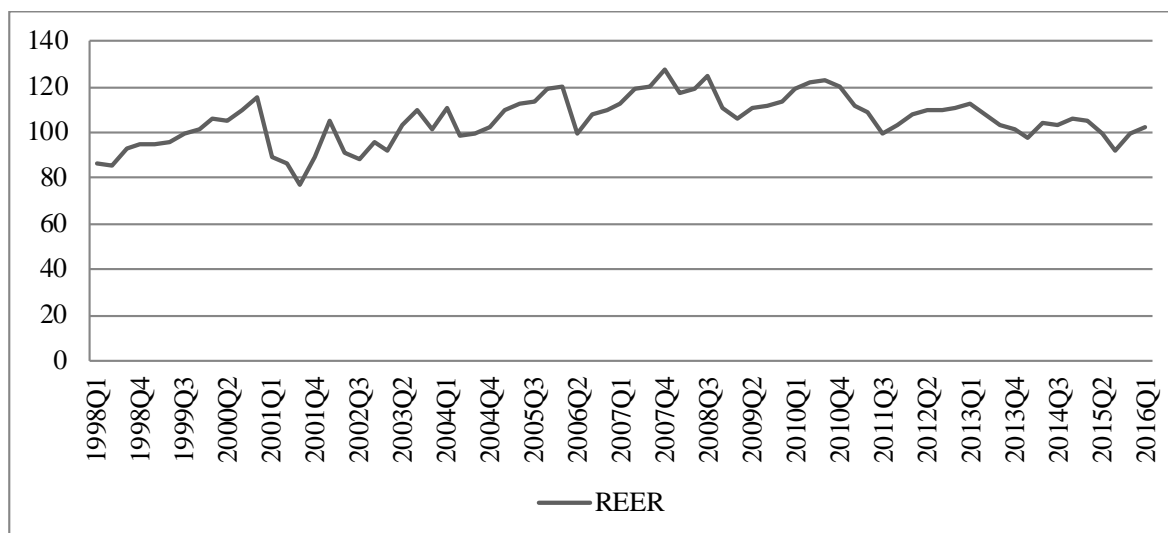
Source: Central Bank of the Republic of Turkey

With the exception of the years 2001-2003, when the Turkish lira highly depreciated, the consecutive years outline strong and stable values of the domestic currency, until the years 2014 and 2015 when a modest downward trend started. Although the period that reflects the dramatic fall in the Turkish lira (2016-2019) is not included in the timeframe investigated in this research, the finding that a decline in the real effective exchange rate increases NPLs in Turkey, is highly relevant to the actual crisis in Turkey and becomes handy for policymakers.

It becomes evident from the above, that there are dissimilarities between what defines the quality of loans in the Albanian and Turkish banking systems. This may be attributed to the clear-cut differences that exist in the two countries' economies and banking sectors, despite the fact that they have been equally categorized as upper middle-income countries and are at the stage of fulfilling the conditions that will ensure their EU membership. Moreover, findings of this research suggest that although Albania is strongly related to Turkey through historic, economic and financial ties, the vulnerability of the Albanian banking system reflected in a deterioration of its loans' quality, significantly depends on the macroeconomic imbalances in the neighbor European countries (Italy) and the risk related to it (the Italian sovereign spread). In contrast, NPLs in Turkey are mostly dependent on domestic issues rather than on international shocks, despite the international financial and trade linkages.

6.2 Conclusions

Summing up, there are clear differences in the factors that determine credit risk in the banking systems of Albania, Italy, Spain and Turkey. Although one would expect these differences not to exist among the developed countries (Italy and Spain) or among the less developed economies

(Albania and Turkey), this research reveals that even among countries that are found in the same level of development, credit risk determinants differ. To this extent, results attained from country-specific studies are superior to those attained by cross-country studies since:

- They rely upon country-specificities or particular circumstances that may not be captured by grouping similar cases.

- They may surface important linkages between countries that are not similar in terms of income or stage of economic and financial development but are strongly tied through trade and bank channels (Albania and Italy).

- They may be more reliable especially when they concern a specific credit risk measure (different from the NPLs ratio), which is considered the most precise credit risk indicator in the particular country. For instance, in the case of Italy, the flow of new bad loans is considered a more accurate credit risk measure than NPLs given that the latter may report misleading results due to write-offs and securitization (Albertazzi et al., 2013) or because credit recovery processing in the Italian banking system is usually long and delayed (Bank of Italy, 2013) . To this extent, the ratio of the flow of new bad loans to total performing loans in the previous quarter, the credit risk proxy that this study uses, is a specificity of the Italian bad loans' reporting system that may only be investigated through an individual country analysis.

Based on the above and the given diversity of findings provided by this thesis, it becomes obvious that a case by case analysis makes a significant difference on credit risk modeling. Individual findings are equally important in cases of banking systems that have been exposed to a prolonged crisis of problematic loans since the onset of the GFC (Italy, Spain and Albania) as well as in those that are encountering difficulties as a result of recent unpleasant events (Turkey). These findings provide useful insights for policymakers that are responsible for the stability of financial systems.

The next chapter concludes the thesis, discusses its limitations and provides some policy recommendations as well as future research path.

Chapter 7: Conclusions

This chapter marks the end of the thesis and aims to summarize the work undertaken focusing on the empirical findings, the research limitations as well as on providing recommendations for regulators and for future research.

The GFC revealed the vulnerability of financial systems, manifested in the increased stock of bank non-performing loans as soon as the crisis burst. Problems arose not only in the powerful countries with advanced economies and financial systems but also in the less developed ones, that were soon contaminated through economic and bank linkages with the countries where the crisis firstly emerged. In the case of Europe, things got worse for five European countries (GIPSI countries[54]) as they were deeply involved in the sovereign debt crisis (2010-2012) that was associated by further economic contraction and more NPLs reported by the banking systems of these countries. With the exception of Italy, the other four countries received bailout loans as things got so serious that the Eurozone was at the edge of ceasing to exist. As unveiled by one of the findings of this thesis, similarly to the case of the GFC, the contagious negative effect of the European debt crisis spread also to non-Eurozone countries as is the case of Albania.

The aim of this research was to explore credit risk determinants in four European countries, namely, Albania, Italy, Spain and Turkey, motivated by the weak economic conditions and the increased bank credit risk in Italy and Spain in the aftermath of the sovereign debt crisis as well as by the probability of a spillover effect in Albania and Turkey given the significant presence of Italian and Spanish banks in their respective banking systems[55]. The investigated timeframe (1998Q1-2016Q1) includes four specific periods, each marking a distinctive phase in the economic and financial performance of the focal countries: the big boom (1998-2007), the burst of the global financial crisis (2008-2009), the recent European sovereign debt crisis (2010-2012) which is particularly relevant to two of the focal countries, namely, Italy and Spain and the aftermath of the two crises (GFC and debt crisis) (2013-2016).

In order to explore the potential credit risk drivers, each country is investigated separately, based on a comprehensive set of quarterly data for variables belonging to the macroeconomic, financial markets, and banking-industry environment. It is worth noting, that the selection of the potential credit risk drivers included in each dataset accounts for the idiosyncratic features of each country.

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[54] GIPSI consists of Greece, Italy, Portugal, Spain and Ireland

[55] Apart from the fact that Italy is the main destination of Albanian exports, the Italian bank that operates in Albania (ISPA), accounts for 13% of the total assets of the Albanian banking system, the third largest share after Turkey and Austria whereas in the case of Turkey, the position of the Spanish bank (BBVA) is quite significant considering that it holds half the shares of the third largest bank (Garanti BBVA) in Turkey asset wise (See Chapter 4) .

Therefore, this research fills in certain gaps identified in the existing literature which are presented below:

a. Most of the studies that investigate credit risk determinants are panel data/cross-country studies that avoid accounting for the individual features of each country and as such ignore also structural breaks that may be significant in the credit risk model. Besides, the consistency of their findings is doubted considering that it is almost impossible to find the same NPLs definitions among various countries' banking systems.

b. The existing single-country studies lack the use of advanced econometric techniques (such as the ARDL approach), are focused on short timeframes and consider a limited number of data, especially in the countries that this research is focused on. Moreover, these studies do not crosscheck their results by applying an alternative approach.

c. To the author's knowledge, the effect of the sovereign debt crisis on the selected credit risk indicators of each focal country, in particular for the countries most related to the crisis, such as Italy and Spain, has not been analyzed by the existing studies[56].

d. Lastly, only a few studies account for cross-border contagion risk as this research does with Albania and Turkey, tightly related to Italy and Spain through trade- and bank-ties (in the case of Albania) or only through bank-linkages (in the case of Turkey). To the author's knowledge, this is the first empirical work that investigates the effect of the European debt crisis on the credit risk of Albanian and Turkish banks.

Drawing on the above gaps, it becomes obvious that the country-specific analysis, as is the approach followed in this research, is crucial to the estimation of credit risk drivers exclusive to each country. Moreover, for the reasons mentioned above, investigating the selected focal countries in this research adds knowledge to the existing empirical literature. To determine credit risk determinants in Albania, Italy, Spain and Turkey, this research applies two distinctive approaches: the ARDL approach to cointegration and the VECM approach, in order for its findings to be accurately estimated and double checked. Finally, the impulse response function is estimated to ensure the dynamic interactions between credit risk indicators of each country and their respective explanatory variables.

Findings provide answers to the two first research questions raised in Chapter 1: they unfold the determinants of credit risk in Albania, Italy, Spain and Turkey and highlight the significance of the sovereign debt crisis risk to the selected credit risk proxy in Italy, Spain and Albania. In the case of the latter, the assumption that the sovereign debt crisis matters to the vulnerability of those financial

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[56] The study by Albertazzi et al. (2013) revealed that the Italian sovereign debt crisis spread has a negative effect on loan loss provisions in Italy. To the author's knowledge, this thesis is the first attempt of investigating such effect on the ratio of the flow of new bad loans.

systems that are not directly involved in the crisis but are interconnected with the heavily indebted countries through trade and banking channels is confirmed. The comparison of findings provided in Chapter 6, answers the third research question regarding the variability of findings among countries that are found at different stages of economic and financial development. It is concluded that individual analyses based on a country's idiosyncratic features/events, provide unique results that vary among countries, even among the ones that are found in a similar level of development.

The findings of this research suggest that credit risk in Italy and Spain is sensitive to the sovereign debt crisis (indicated by the Italian sovereign debt spread in the case of Italy and the Spanish long-term government bond rate in the case of Spain) and the banking-industry environment. In the case of Spain though, bank-specific variables seem to play a more important role in defining credit risk since the latter is positively affected by three bank-variables (the capital to assets ratio, the return on equity and credit volume) whereas the Italian credit risk is sensitive only to the capital to assets ratio. Moreover, empirical findings suggest that credit risk in is positively affected by the financial markets' volatility (VIX) although it is immune to the GFC. On the other hand, in the case of Spain, credit risk is positively related to the global financial crisis.

On the other hand, credit risk in Albania is affected by variables from the macroeconomic (money supply), the financial (the Italian sovereign debt spread) and the banking-industry (the capital to assets ratio) environment whereas only macroeconomic variables (the real effective exchange rate) and financial markets' indicators (BIST gold index and VIX) appear to play an important role on credit risk in Turkey. Moreover, the individual country analysis uncovers unique events that affect credit risk in the country such as the spillover effect of the Italian debt crisis (in the Albanian credit risk) and the initiation of banking sector reforms in Albania while in the case of Turkey the 2000 and 2001 financial crisis in Turkey.

With regard to the policy implications, this thesis provides recommendations as below:
- Given the strong connection between business cycle and financial stability, policymakers and regulators should pay particular attention to those signs in the economy that indicate a future financial turmoil, such as an aggressive demand for housing, high real estate prices, high unemployment rate or governments' excessive indebtedness.
- The GFC revealed that the European policy-making framework should be focused not only on each country's regulation framework but also on that of the European integration as a whole. As developing countries have less expertise in dealing with financial crises and the associated economic contraction, the respective central banks should cooperate with those in the advanced economies, to expand their knowledge on the key steps to be followed in cases

of financial turbulence. Promoting policies and solutions to the crises may improve the prospects for developing countries.

- Central banks in developing countries like Albania and Turkey, with a high share of foreign currency bank loans should seriously take their role as financial stability supervisors. More precisely, the fact that foreign currency loans constitute a significant share of the total loans granted by the Albanian and the Turkish banks, makes them highly exposed to exchange rate volatility. To avoid a drastic increase on NPLs as a result of domestic currency depreciation, the respective central banks may strengthen the resilience of these countries' banking systems by imposing the restriction that foreign currency loans should not be granted to unhedged borrowers or by determining higher risk weights or bigger provisions on foreign lending.

This research however, has certain limitations, which are related to data availability and data quality that restrict the modeling approaches. For instance, quarterly data on NPLs in Italy is available since the year 2009 and therefore this credit risk proxy could not be included in Italy's model. Instead, this research uses the ratio of the flow of new bad loans to total loans of the Italian banking system. In the case of Albania, data on the first three quarters of the year 1998 is not available as such period is related to the critical economic, financial and political conditions in the country during the year 1997 as a result of the pyramids scheme collapse and the time needed to recover. Overall, in the case of Albania, there are certain variables that most probably constitute potential credit risk drivers but quarterly data on them is available only for very short time periods or is totally absent (remittances, real effective exchange rate and foreign currency loans). Hence, the respective regulatory authorities and institutes of statistics should pay more attention in regularly updating the existing data in order to ensure a longer timeframe available for research. In the case of Spain, the unemployment rate could not be included in the respective empirical model although it constitutes one of the most problematic issues in the country. The underlying reason is the restriction caused by the fact that the series contains two unit roots and as such the ARDL approach to cointegration cannot be applied.

To this extent, recommendations for future research would consist of checking on data updates or new data uploads on indicators which could not be included in the present research[57]. As more data becomes available it would be interesting to analyze the explanatory power of variables that are theoretically relevant to credit risk but data on them has been inexistent/restricted. Moreover, the investigation of an extended timeframe is necessary due the high NPLs reported still by the

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[57] For instance, data on the real effective exchange rate would be useful in the case of Albania as the latter could be an important credit risk driver given the considerable amount of foreign currency loans granted by the Albanian banks (60% of the total outstanding loans as of end of June 2015).

baking systems of Albania, Italy and Spain. On the other hand, in the case of Turkey, the significant Turkish lira depreciation and the political turbulence in the country have provided a suitable environment for growing economic and financial vulnerabilities and therefore further research that considers a more extended time-interval is a necessity.

Regarding the methodological route, the ARDL approach to cointegration is the recommended approach to be applied for the same countries in the future or in the context of other developing countries given the advantages that it holds compared to other econometric models. However, increasing the results' accuracy by applying additional econometric techniques (such as the VECM framework, in the case of this research) remains the key recommendation methodology-wise. Undoubtedly, a stable and efficient financial sector helps promote a healthy economic growth. Hence, any factors that could endanger the stability of the financial sector should be known and addressed appropriately.

Lastly, future research entails more country-specific studies on credit risk. Given that a panel data study cannot always incorporate the idiosyncratic features and particular circumstances that may play an important role on credit risk, investigating individual countries is the key recommendation for future research.

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Appendix

Appendix A: Credit risk indicators

Table A1. Albania's dataset

Indicators		
NPL	Non-performing loans/ Total loans	Bank of Albania
UNE	Unemployment rate (%)	Bank of Albania
CA	Current Account	Bank of Albania
TB	Trade Balance	Bank of Albania
GED	Gross External Debt	Bank of Albania
M1	Currency in circulation plus overnight deposits	Bank of Albania
M2	M1 plus deposits with a maturity of up to two years and deposits redeemable at a period of notice of up to three months	Bank of Albania
M3	M2 plus marketable instruments issued by monetary and financial institutions	Bank of Albania
OIL	Brent crude oil price (fob), euro per barrel	ECB
VIX	The CBOE Volatility Index	ECB
EURI3M	Euro Interbank Offered Rate of 3 months, period average (% p.a.)	ECB
ITSPREAD	The Italian sovereign debt risk: Spread differential between Italian and German long-term government bond yields	ECB
ITYIELD	The Italian yield curve slope: Spread differential between long-term Italian government bond yield and the 3 month Euribor	ECB
CRED	Total loans granted by Albanian banks	Bank of Albania
ROA	Return on Assets	Bank of Albania
ROE	Return on Equity	Bank of Albania
REL	Loans granted to real estate sector to total loans	Bank of Albania
RELR	Average interest rate on loans granted to real estate sector (% p.a.)	Bank of Albania
CON	The banks' concentration ratio	Bank of Albania
CAP	Capital to assets ratio	Bank of Albania
LASS	Loans to assets ratio	Bank of Albania
LDEP	Loans to deposits ratio	Bank of Albania

Table A2. Italy's dataset

Indicators		
NBLR	The flow of the adjusted new bad loans/total performing loans on the previous quarter	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 (2005, base year)	Bank of Italy
GFCF	Gross fixed capital formation at constant terms	Bank of Italy
TCONS	Total consumption at constant prices	Bank of Italy
M1	Currency in circulation plus overnight deposits	Bank of Italy
M2	M1 plus deposits with a maturity of up to two years and deposits redeemable at a period of notice of up to three months	Bank of Italy
M3	M2 plus marketable instruments issued by monetary and financial institutions	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	Bank of Italy
LTGB	Average interest rate of long-term Italian government bond (% p.a.).	Bank of Italy
EURI3M	Euro Interbank Offered Rate of 3 months, period average (% p.a.)	Bank of Italy
SPREAD	The Italian sovereign debt risk: Spread differential between Italian and German long-term government bond yield	Bank of Italy
YIELD	The Italian yield curve slope: Spread differential between long-term Italian government bond yield and the 3 month Euribor	Bank of Italy
CRE	Gross loans granted by the Italian 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
HINT	Average interest rate on loans granted to households (% p.a.)	Bank of Italy
CINT	Average interest rate on loans granted to non-financial companies (% p.a.)	Bank of Italy
DEPINT	Average interest rate on deposits (% p.a.)	Bank of Italy

Table A3. Spain's dataset

Indicators		
NPL	Non-performing loans/Total loans	Bank of Spain
CPI	Consumer Price Index annual rate (%)	Bank of Spain
UNE	Unemployment rate (%)	ECB
CA	Current Account	Bank of Spain
GD	Total General Government Debt	Bank of Spain
GDGDP	General Government Debt as % of GDP	Bank of Spain
FDI	Foreign direct investment, quarterly flow	Bank of Spain
TB	Trade Balance	Bank of Spain
GDP	Real GDP at constant (2005) terms	Bank of Spain
GFCF	Gross fixed capital formation	Bank of Spain
TCONS	Total consumption expenditure contribution in GDP	Bank of Spain
REER	Real effective exchange rate	Bank of Spain
PROP	Property prices in Spain, in Euro/sqm	Bank of Spain
M1	Currency in circulation plus overnight deposits	Bank of Spain
M2	M1 plus deposits with a maturity of up to two years and deposits redeemable at a period of notice of up to three months	Bank of Spain
M3	M2 plus marketable instruments issued by monetary and financial institutions	Bank of Spain
OIL	Brent crude oil price fob in Euro per barrel	ECB
VIX	The CBOE Volatility Index	ECB
LTGB	Average interest rate of long-term Spanish government bond (% p.a.).	ECB
EURI	Euro Interbank Offered Rate of 3 months, period average (% p.a.)	ECB
CRE	Gross loans granted by the Spanish banks	Bank of Spain
ROA	Return on Assets	Bank of Spain
ROE	Return on Equity	Bank of Spain
CAP	Capital to assets ratio	Bank of Spain
LDEP	Loans to deposits ratio	Bank of Spain
LASS	Loans to assets ratio	Bank of Spain
MORT	Mortgage loans/Total loans	Bank of Spain
CONST	Loans granted to the construction sector/ Total loans	Bank of Spain

Table A4. Turkey's dataset

Indicators		
NPL	Non-performing loans/Total loans	CBRT
CPI	Consumer Price Index annual rate (%)	CBRT
LWPI	Wholesale price index	CBRT
GDP	Real GDP at constant 1998 prices	CBRT
GFCF	Gross Fixed Capital Formation	CBRT
CONSTR	Construction expense contribution in GDP	CBRT
HOCONS	Household consumption expenditure contribution in GDP	CBRT
GED	Gross external debt	CBRT
CA	Current Account	CBRT
TB	Trade Balance	CBRT
M1	Currency in circulation plus overnight deposits	CBRT
M2	M1 plus deposits with a maturity of up to two years and deposits redeemable at a period of notice of up to three months	CBRT
M3	M2 plus marketable instruments issued by monetary and financial institutions	CBRT
REER	Real effective exchange rate	CBRT
GOLD	Gold London selling price in usd/ons	CBRT
BISTGI	Borsa Istanbul gold index	CBRT
BIST	BIS100 closing price	CBRT
OIL	Brent crude oil price fob in Euro per barrel	ECB
VIX	The CBOE Volatility Index	ECB
ITSPREAD	The Italian sovereign debt risk: Spread differential between Italian and German long-term government bond yield	ECB
ITYIELD	The Italian yield curve slope: Spread differential between long-term Italian government bond yield and the 3 month Euribor	ECB
SSPREAD	The Spanish sovereign debt risk: Spread differential between Italian and German long-term government bond yield	ECB
SYIELD	The Spanish yield curve slope: Spread differential between long-term Italian government bond yield and the 3 month Euribor	ECB
CRE	Gross loans granted by the Turkish banks	CBRT
CAP	Capital to assets ratio	CBRT
LDEP	Loans to deposits ratio	CBRT
ROA	Return on Assets	CBRT
ROE	Return on Equity	CBRT
CLI	Cost of living index	CBRT

Appendix B: Unit root tests

Table B1. Unit root test results for Albania

Indicators	ADF				PP			
	Only with a constant		Constant & a trend		Only with a constant		Constant & a trend	
	Level	First difference	Level	First difference	Level	First difference	Level	First difference
NPL	-2,840	-8,189*	-3,079	-8,672*	-2,848	-8,840*	-2,906	-8,949*
UNE	-1,655	-6,789*	-1,677	-7,352*	-1,604	-7,212*	-0,935	-7,392*
CA	-3,312***		-5,566*		-3,861***		-6,812*	
TB	-2,331	-11,105*	-3,802	-11,044*	-1,807	-15,580*	4,952	-16,201*
LGED	0,062	-7,947*	-2,698	-7,917*	0,389	-8,169*	-2,455	-8,243*
M1	-1,253	-8,550*	-2,449	-8,539*	-2,046	-9,174*	-2,209	-9,938*
M2	-2,755	-9,041*	-0,333	-10,589*	-6,463*	-9,675*	-0,320	-16,051*
M3	-2,909	-6,225*	0,528	-7,142*	-3,865**	-6,975*	0,290	-7,471*
OIL	-1,689	-6,882*	-1,354	-6,923*	-1,907	-6,915*	-1,455	-7,145*
VIX	-3,957**		-4,026**		-4,186*		-4,248*	
EU3M	-0,577	-4,172*	-1,685	-4,145*	-0,774	-3,912***	-1,682	-3,905***
IT SPREAD	-1,637	-9,068*	-1,873	-9,020*	-1,754	-10,003*	-2,142	-9,954*
IT YIELD	-1,561	-7,632*	-1,630	-7,580*	-2,105	-7,773*	-1,982	-7,743*
CRED	-6,614	-3,560**	0,894	-5,400*	-2,651	-4,664*	0,920	-5,108*
ROA	-2,717	-8,519*	-3,673	-8,455*	-5,089*		-5,557*	
ROE	-2,127	-10,176*	-3,584	-10,109*	-7,987*		-10,355*	
REL	-0,656	-6,057*	-0,417	-6,043*	-0,687	-7,726*	-1,790	-7,698*
RELR	-1,889	-7,975*	-2,111	-7,928*	-2,526	-8,403*	-2,439	-8,383*
CON	-4,752	-7,102*	-1,586	-9,040*	-4,469*	-8,499*	-1,032	-9,422*
CAP	-2,665	-6,122*	-2,733	-6,162*	-2,476	-6,326*	-2,409	-6,397*
LASS	-2,427	-4,424**	1,280	-4,948*	-1,238	-5,894*	-0,678	-5,934*
LDEP	-1,408	-5,616*	-0,209	-5,732*	-1,236	-6,325*	-0,892	-6,123*

(***), (**) and (*) denote stationary of the residuals at 10%, 5% and 1% level of significance.

Table B2.   Unit root test with structural break for Albania

	Perron	Zivot-Andrews
Breakpoint	2001Q3	2001Q3
Lag	0	1
t-statistic	**-3,72**	**-3,58**
1%	-5,92	-5,34
5%	-5,23	-4,93
10%	-4,92	-4,58

Table B3.   Unit root test results for Italy

Indicators	ADF Only with a constant		ADF Constant & a trend		PP Only with a constant		PP Constant & a trend	
	Level	First difference	Level	First difference	Level	First difference	Level	First difference
NBLR	-2.711	-17.712*	-4.040*		-4,127*		-4.901*	
UNE	-1.513	-8.233*	-2.162	-8.410*	-1,663	-8,713*	-1.505	-11.075*
CPI	-2.781	-4.069*	1.784	-4.552*	-1,589	-4,391*	0.984	-4.359*
CA	-4.175*		-4.244*		-5,393*		-5.325*	
GED	-0,608	-9.112*	-3.566**	-9.040	-0,395	-10,466*	-3.611**	
IPI	-0,688	-5.539*	-2.225	-5.507*	-0,649	-5,521*	-1.827	-5.468*
PD	-0,049	-9.828*	-4.476*		1,034	-13,917*	-4.570*	
GDP	-2.335	-3.503**	-2.473	-3.603**	-2,187	-3,129***	-1.790	-2.918***
GFCF	-0,021	-5.367*	-2.481	-5.876**	-1,147	-6,440*	-1.911	-6.174*
CONS	-2.952	-4.582*	-2.398	-4.879**	-2,688	-4,968*	-2.106	-4.874*
HOCONS	-2.111	-4.104*	-2.003	-4.159**	-2,498	-3,923**	-1.853	-3.776**
M1	-0,894	-14.271*	-2.407	-14.172*	-2,026	-12,744*	-3	-13.422*
M2	-0,725	-13.716*	-2.080	-13.648*	-2,416	-9,790*	-4.069*	
M3	-1.927	-9.927*	-0,802	-10.478*	-3,661**		-2.367	-10.363*
FTSEMIB	-1.363	-6.568*	-1.845	-6.509*	-1,305	-7,048*	-2.050	-6.983*
OIL	-1.954	-6.974*	-1.429	-7.071*	-1,674	-7,067*	-1.390	-7.246*
VIX	-4.059*		-4.140*		-4,697*		-4,807*	
EURI3M	-0,596	-4.474*	-1.781	-4.497*	-0,933	-3,703**	-1.676	-3.647**
LTGB	-0,799	-9.415*	-1.675	-9.586*	-1,010	-9,504*	-1.629	-9.763*
SPREAD	-1.725	-10.128*	-2.107	-10.138*	-1,758	-10,270*	-2.217	-10.210*
YIELDC	-1.718	-7.938*	-1.633*	-7.883*	-1,947	-7,854*	-1.954	-7.833*
CRED	3.582	-8.582*	-0.358	-10.273*	-2,169	-10,526*	0,021	-10.300*
CAP	-0,017	-9.001*	-2.158	-9.099	0,182	-10,127*	-1.784	-12.003*
DEP	-0,256	-8.178*	-2.151	-8.845*	-0,537	-9,034*	-1.808	-9.334*
LASS	-1.591	-6.768*	-3.069	-6.929*	-2,597	-8,231*	-3.359***	
HINT	-0,860	-3.974**	-1.470	-3.763**	-3.047**		-3.511***	
CINT	-0,783	-3.643**	-0.998	-3.631**	-2,639	-3,710**	-2.896	-3.491**

(***), (**) and (*) denote stationary of the residuals at 10%, 5% and 1% level of significance.

Table B4 .   Summary of unit root tests with structural break for Italy

	Perron	Zivot-Andrews
Breakpoint	2008Q3	2008Q3
Lag	4	4
t-statistic	**-3,81**	**-3,76**
1%	-5,92	-5,57
5%	-5,23	-5,08
10%	-4,92	-4,82

Table B5. Unit root test results for Spain

Indicators	ADF				PP			
	Only with a constant		Constant & a trend		Only with a constant		Constant & a trend	
	Level	First difference	Level	First difference	Level	First difference	Level	First difference
NPL	0.691	-3,871**	-1,756	-3,916**	-0,102	-3,917**	-1,759	-3,791**
CPI	-2,287	-9,711*	0,976	-10,928*	-1,891	-10,505*	2,317	-10,658*
CA	-1,715	-9,271*	-2,030	-9,269*	-1,920	-9,645*	-1,937	-10,098*
GDGDP	0.836	-4,087*	-1,537	-4,436*	-0,664	-5,157*	-1,425	-5,152*
FDI	-6,515*		-6,557*		-7,207*		-7,079*	
TB	-1,778	-8,690*	-2,155	-8,763*	-1,563	-9,632*	-1,412	-9,871*
GDP	-2,119	-31,027*	-2,685	-34,157*	-3,355**		-2,947	-21,199*
GFCF	-2,999	-24,727*	-2,821	-25,770*	-2,930**		-2,644	-19,100*
REER	-1,593	-10,715*	-0,978	-11,180*	-1,755	-10,395*	-0,814	-11,432*
LPROP	-4,441	-2,936***	-0,895	-3,908**	-2,239	-4,764*	-0,772	-5,859*
M1	-1,467	-8,555*	-1,468	-8,588*	-1,695	-8,944*	-1,634	-9,016*
M2	-3,215	-6,496*	-0,428	-7,319*	-1,956	-9,403*	-0,853	-9,246*
M3	-3,302	-6,204*	-0,257	-7,218*	-1,957	-8,542*	-0,631	-8,257*
OIL	-1,899	-6,692*	-1,055	-6,821*	-1,680	-6,726*	-1,099	-6,833*
VIX	-4,059*		-4,140*		-4,697*		-4,807*	
LTGB	-1,019	-8,994*	-1,648	-9,069*	-1,302	-9,075*	-1,720	-9,151*
SPREAD	-1,381	-10,061*	-1,834	-10,032*	-1,491	-9,819*	-1,981	-9,751*
YIELD	-1,620	-7,394*	-1,645	-7,330*	-1,886	-7,308*	-1,972	-7,262*
EURI	-0,596	-4,474*	-1,781	-4,497*	-0,933	-3,703**	-1,676	-3,647**
CRED	-4,186*		1,530	-5,194*	-1,992	-5,928*	0,203	-7,568*
ROA	-6,175*		-6,800*		-7,447*		-7,136*	
ROE	-5,479*		-6,422*		-7,140*		-7,142*	
CAP	0,551	-5,900*	-0,986	-6,034*	-0,093	-6,425*	-1,299	-6,182*
LDEP	0,215	-7,031*	-1,161	-7,594*	0,312	-8,412*	-1,263	-7,985*
LASS	0,604	-6,101*	-0,961	-6,292*	0,862	-7,562*	-1,063	-7,123*
MORT	-2,328	-6,744*	-1,856	-6,991*	-1,298	-7,632*	-1,968	-7,014*
CONST	-0,329	-9,873*	-0,523	-9,623*	-0,652	-9,993*	-0,657	-9,879*

(***), (**) and (*) denote stationary of the residuals at 10%, 5% and 1% level of significance.

Table B6. Summary of unit root tests with structural break for Spain

	Perron	Zivot-Andrews
Breakpoint	2010Q3	2010Q3
Lag	1	1
t-statistic	**-2,94**	**-2,9**
1%	-5,92	-5,34
5%	-5,23	-4,93
10%	-4,92	-4,58

Table B7.   Unit root test results for Turkey

Indicators	ADF				PP			
	Only with a constant		Constant & a trend		Only with a constant		Constant & a trend	
	Level	First difference	Level	First difference	Level	First difference	Level	First difference
NPL	-0,999	-6,652*	-1,766	-6,602*	-1,772	-6,666*	-2,619	-6,699*
LWPI	-8,685*		-5,737*		-5,538*		-3,172**	
GDP	-2,336	-7,995*	-6,456	-7,938*	-2,065	-14,783*	-6,412*	
GFCF	-1,791	-11,600*	-2,891	-11,530*	-1,345	-12,413*	-2,950*	
CONSTR	-1,205	-7,691*	-2,698	-7,632*	-0,792	-8,706*	-2,615	-8,620*
HOCONS	-1,605	-8,289*	-4,293	-8,228*	-1,042	-7,662*	-5,124*	
CLI	1,086	-15,218*	-1,471	-15,775*	2,302	-12,981*	-1,829	-14,047*
GED	-1,175	-7,094*	-1,139	-7,203*	-1,272	-6,974*	-1,426	-6,970*
CA	-2,908**		-3,916**		-2,848	-14,607*	-3,818**	
TB	-3,725**		-4,085*		-4,256*		-5,324*	
M1	-2,811	-9,455*	-1,801	-10,826*	-6,993*		-2,495	-12,347*
M2	-3,706**		-1,534	-7,982*	-5,974*		-2,496	-8,627*
M3	-3,814**		-1,534	-8,105*	-6,191*		-2,223	-8,742*
REER	-2,960**		-3,125	-9,158*	-3,070**		-3,460**	
GOLD	-0,821	-5,934*	-0,796	-5,908*	-0,925	-6,356*	-1,739	-6,313*
IGMI	-0,821	-5,433*	-0,699	-5,411*	-0,934	-5,757*	-1,725	-5,714*
BIST	-0,886	-6,453*	-2,667	-6,404*	-0,521	-6,816*	-2,188	-6,721*
OIL	-1,899	-6,692*	-1,055	-6,821*	-1,680	-6,726*	-1,099	-6,833*
VIX	-4,059*		-4,140*		-4,697*		-4,807*	
CRED	-2,563	-5,568*	-1,199	-5,872*	-2,918	-6,234*	-1,145	-6,509*
CAP	-2,507	-11,043*	-2,490	-11,050*	-2,338	-12,101*	-2,673	-12,543*
LDEP	1,310	-5,337*	-3,651	-5,414*	0,595	-1,166*	-5,156	-6,407*
ROA	-3,555**		-3,772**		-3,653**		-3,523**	
ROE	-3,352**		-3,604**		-3,111**		-3,960**	
LASS	0,728	-5,539*	-3,319***		-0,348	-6,344*	-4,563*	

(***), (**) and (*) denote stationary of the residuals at 10%, 5% and 1% level of significance.

Table B8. Summary of unit root tests with structural break for Turkey

	Perron	Zivot-Andrews
Breakpoint	2003Q3	2003Q3
Lag	0	4
t-statistic	**-3,77**	**-3,57**
1%	-5,92	-5,34
5%	-5,23	-4,93
10%	-4,92	-4,58

Appendix C VAR Lag Selection Criteria

Table C1. VAR Lag Order Selection Criteria for Albania

Endogenous variables: NPL ITSPREAD CAP M1

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-121.8760	NA	0.000602	3.935636	4.201049	4.040513
1	243.3612	664.0676	1.53e-08	-6.647310	-5.851071*	-6.332678*
2	261.6175	30.98033*	1.44e-08*	-6.715681*	-5.388618	-6.191295
3	276.4443	23.36343	1.51e-08	-6.680130	-4.822241	-5.945989
4	290.9159	21.04959	1.64e-08	-6.633814	-4.245100	-5.689920

Table C2. VAR Lag Order Selection Criteria for Italy

Endogenous variables: NBLR SPREAD CAP VIX

Lag	LogL	LR	FPE	AIC	SC	HQ
0	560.0328	NA	1.18e-12	-16.11689	-15.98738	-16.06551
1	757.7796	366.8347	6.07e-15	-21.38492	-20.73735*	-21.12800
2	783.2548	44.30475	4.64e-15	-21.65956	-20.49394	-21.19712*
3	790.6225	11.95911	6.03e-15	-21.40935	-19.72567	-20.74138
4	817.8429	41.02782*	4.46e-15*	-21.73458*	-19.53285	-20.86108

Table C3. VAR Lag Order Selection Criteria for Spain

Endogenous variables: NPL LTGB CAP ROE CRED

Lag	LogL	LR	FPE	AIC	SC	HQ
0	454.4201	NA	1.51e-12	-13.02667	-12.86478	-12.96244
1	978.1377	956.3539	8.00e-19	-27.48225	-26.51090*	-27.09689*
2	1011.489	56.06878	6.35e-19	-27.72432	-25.94351	-27.01781
3	1048.028	56.13295*	4.68e-19*	-28.05879	-25.46853	-27.03115
4	1073.904	36.00060	4.83e-19	-28.08417*	-24.68444	-26.73538

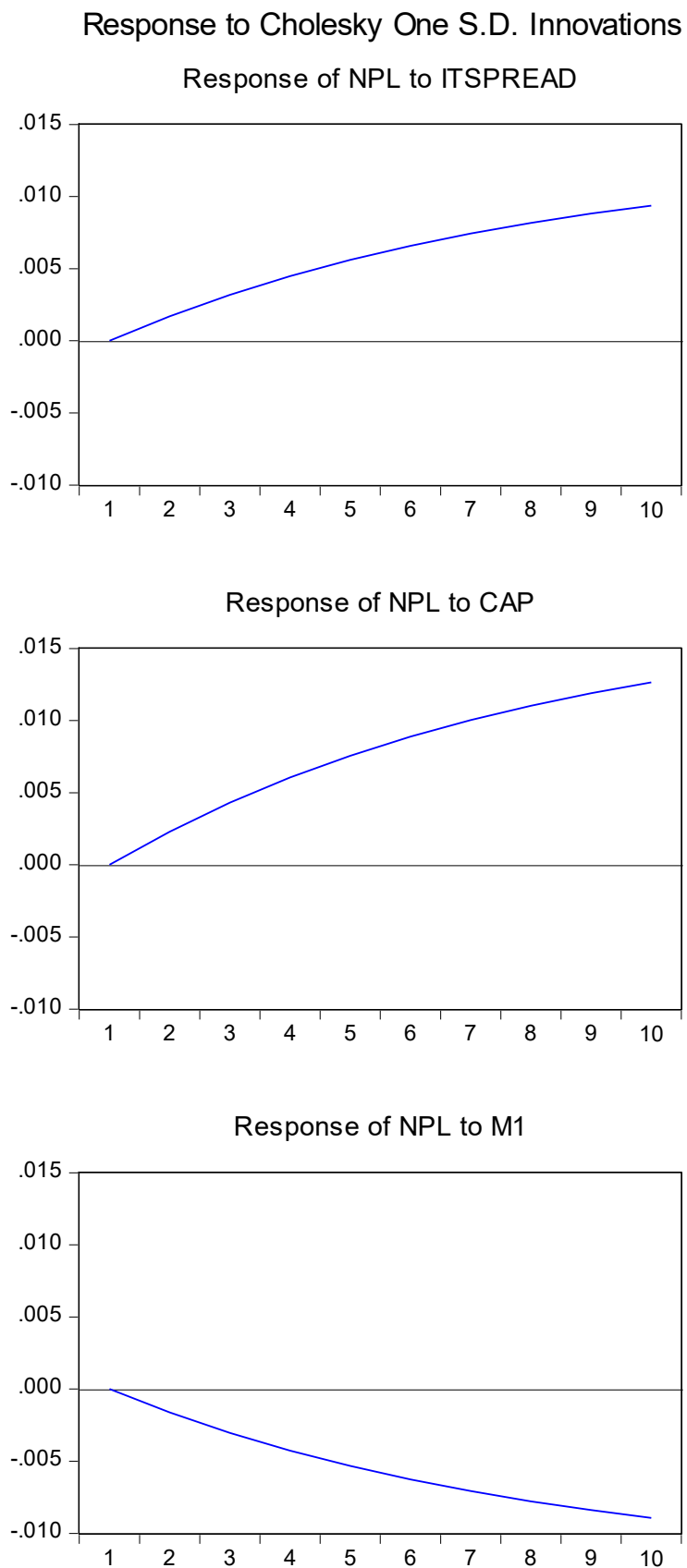### Table C4. VAR Lag Order Selection Criteria for Turkey

Endogenous variables: NPL BISTGI REER VIX

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-952.2741	NA	12820931	27.71809	27.84760	27.76947
1	-703.7345	461.0590	15173.72	20.97781	21.62538*	21.23472*
2	-687.4275	28.35997*	15114.10*	20.96891*	22.13453	21.43135
3	-682.1209	8.613553	20859.88	21.27887	22.96254	21.94684
4	-671.9543	15.32361	25281.85	21.44795	23.64968	22.32145

Figure D1. Impulse responses for Albania

Response to Cholesky One S.D. Innovations

Response of NPL to ITSPREAD

Response of NPL to CAP

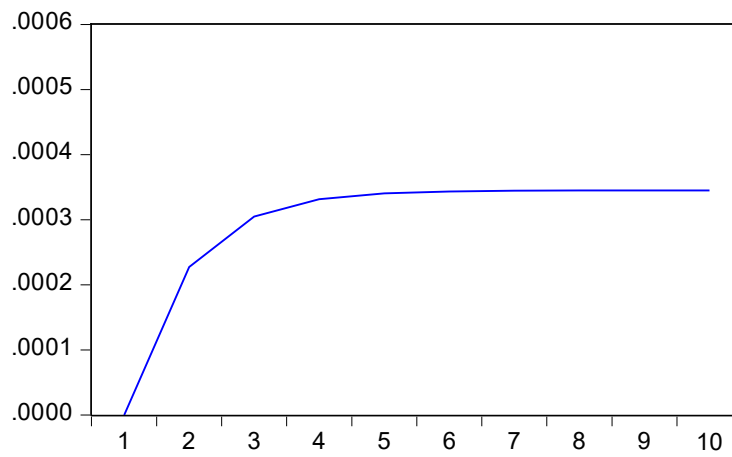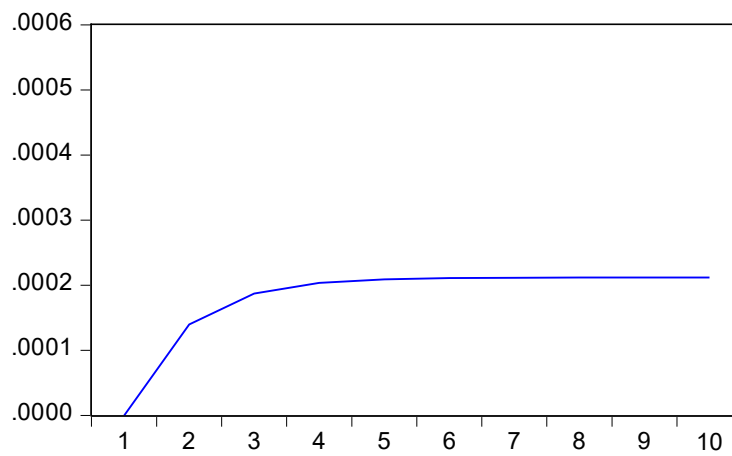
Response of NPL to M1

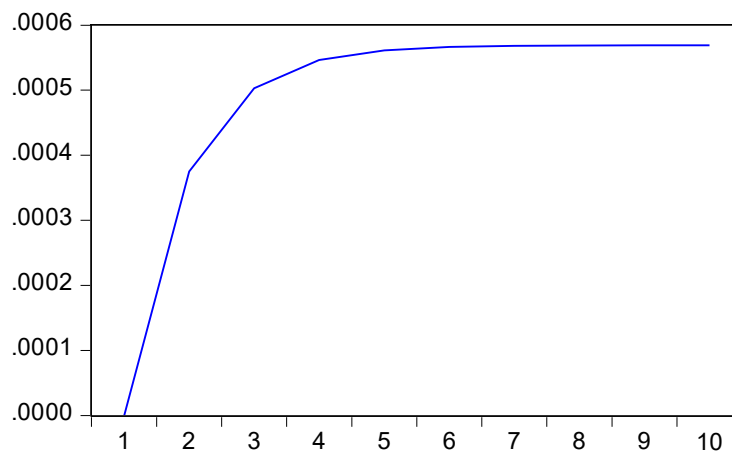**Figure D2. Impulse responses for Italy**

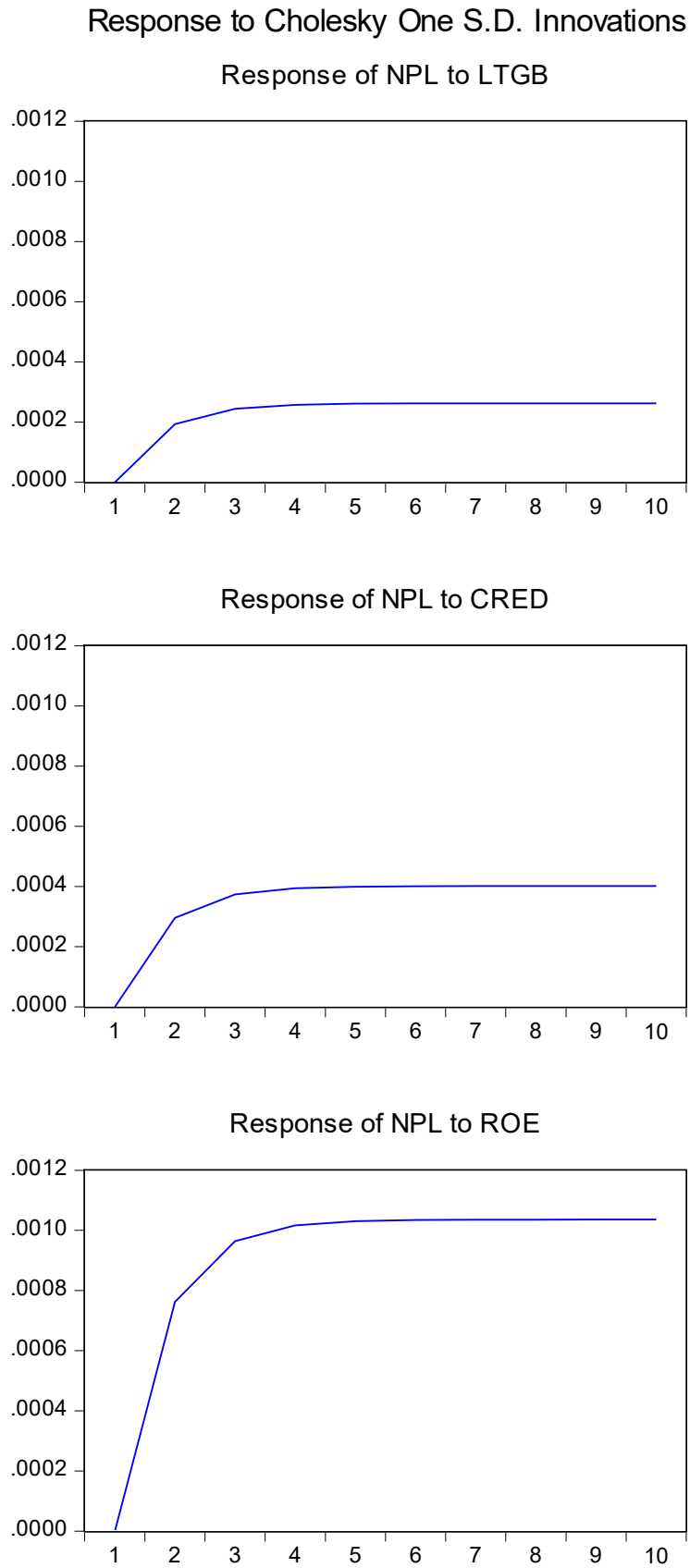Response to Cholesky One S.D. Innovations

Response of NBLR to SPREAD

Response of NBLR to CAP

Response of NBLR to VIX

Figure D3. Impulse responses for Spain

Response to Cholesky One S.D. Innovations

Response of NPL to LTGB

Response of NPL to CRED

Response of NPL to ROE

Figure D4. Impulse responses for Turkey

Response to Cholesky One S.D. Innovations