

THE CAPITAL STRUCTURE DETERMINANTS OF THE
PORTUGUESE BANKS (2008-2017)

Nuno Ricardo da Gama Vieira Ferreira de Castro

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Supervisor:

Ilídio Tomás Lopes, PhD, Assistant Professor – ISCTE Business School, Accounting
Department

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The conclusion of this dissertation means to me the closure of a cycle of enormous personal significance.

However, the attainment of this personal goal, which I value so much, can never be separated from the moment and the people who helped me on this path.

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Abstract

Since the beginning of the global financial crisis in 2008, bank soundness has been repeatedly questioned. In line with this doubt that has been floating over the banking system, several academic studies have been addressing this issue through various approaches including the capital structure perspective. With regard to the Portuguese banking system, the last decade has meant for the Portuguese banks one of the most complex periods in their history, with their solvency and soundness repeatedly questioned. Thus, without ever losing sight on the economic environment of the recent years, this paper aims to analyze the level of interdependence between the financial leverage of Portuguese banks and the set of variables that have empirically shown a significant impact on this indicator. A multiple linear regression model was used to assess the relationship between the dependent variable (financial leverage) and the set of selected explanatory variables. The results indicate that there is a significant impact of regulatory capital, the global financial crisis and the eurozone crisis on the leverage levels of the Portuguese banks.

Keywords: Capital Structure; Leverage; Equity; Regulatory Capital; Portuguese banking.

JEL Classification:

Resumo

Desde a crise financeira internacional de 2008, que a solidez bancária tem vindo a ser recorrentemente questionada. Em sintonia com esta dúvida que tem pairado sobre o sistema bancário, vários estudos académicos têm vindo a debruçar-se sobre este tema através de diversas abordagens incluindo a vertente da estrutura de capitais. No que se refere ao sistema bancário português, a última década significou para os bancos portugueses um dos períodos mais complexos da sua história, tendo-se também questionado por variadas vezes acerca da sua solvabilidade e solidez. Assim, sem nunca perder de vista a conjuntura económica dos últimos anos, este trabalho pretende analisar o nível de interdependência existente entre a alavancagem financeira dos bancos portugueses e o conjunto de variáveis que empiricamente têm demonstrado um impacto significativo sobre este indicador. Assim, foi utilizado um modelo de regressão linear múltipla a fim de avaliar qual a relação entre a variável dependente (alavancagem financeira) e o conjunto de variáveis explicativas selecionadas. Os resultados obtidos indicam que a existência de um impacto significativo do capital regulatório, da crise financeira internacional e da crise da zona euro sobre os níveis de alavancagem dos bancos portugueses.

Palavras-chave: Banca Portuguesa; Estrutura de Capitais; Alavancagem; Capital Próprio; Capital Regulatório.

JEL Classification:

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Acronyms and Abbreviations

A

APB Associação Portuguesa de Bancos

B

BANIF Banco Internacional do Funchal

BCBS Basel Committee on Banking Supervision

BdP Banco de Portugal

BEL Belgium

BES Banco Espírito Santo

BFE Banco de Fomento e Exterior

BPA Banco Português do Atlântico

BPI Banco Português de Investimento

BPN Banco Português de Negócios

BPP Banco Privado Português

C

CS Capital Structure

CT1 Core Tier 1

D

DEU Deutschland

DNK Denmark

E

EC European Commission

ECB European Central Bank

ECSC European Coal and Steel Community

ECU European Currency Unit

EEC European Economic Community

EERP European Economic Recovery Plan

EFAP Economic and Financial Assistance Program

EFSF European Financial Stability Facility

EMS European Monetary System

EMU European Monetary Union

ESM European Stability Mechanism

ESP Spain

EU European Union

EURATOM European Atomic Energy Community

F

FE Fixed Effects

Fed Federal Reserve

FRA France

FSB Financial Stability Board

G

GBR Great Britain

GDP Gross Domestic Product

GFC Global Financial Crisis

GRC Greece

I

IMF International Monetary Fund

IRL Ireland

ITA Italy

L

LDR Loan-to-Deposit Ratio

LUX Luxemburg

M

MLR Multiple Linear Regression

N

NLD Netherlands

NPL Non-Performing Loans

O

OLS Ordinary Least Squares

P

PRT Portugal

R

RE Random Effects

RWAs Risk-Weighted Assets

S

SEC Securities and Exchange Commission

U

US United States of America

V

VIF Variance Inflation Factor

W

WACC Weighted Average Cost of Capital

1. Introduction

1.1. Problem Background

The Global Financial Crisis¹ (GFC) revealed that the existing capital regulation at the time was inadequate – in its design or implementation – to prevent a panic in the financial sector. Regardless many of the rescued banks appeared to be in compliance with minimum capital requirements shortly before, and even during the crisis, governments around the world had to step in with emergency support to prevent a collapse. As a result, a debate ensued on how to strengthen regulation, whereas standing out that capital continues to play an important role (Demirguc-Kunt et al., 2013).

While many insightful discussions of liquidity and leverage requirements are available in the literature, financial theory has made little headway in developing models that can provide quantitative guidance for bank Capital Structure (CS) decisions and for the effects of regulatory requirements on those decisions and the resulting insolvency risk (Hugonnier & Erwan, 2017).

CS in itself, has been studied since 1950s by financial scholars who have proposed different theories about optimal financial structure of firms. However, financing decisions of banks remain an enigma, increasingly attracting the attention of banking regulators and corporate finance scholars alike. So far, banks have been excluded from extant studies of capital structure mainly because it was reasoned that regulation was the overriding determinant of banking CS. Notwithstanding, there has been increasing empirical work to the contrary (Sibindi, 2018). On the other hand, the cost to the economy of the GFC and the scale of public support to the financial sector has been enormous. One way to reduce such costs is to have banks make greater use of equity funding (Miles et al., 2012).

CS can be defined as the combination of debt and equity a company uses to finance its overall operations and growth, allowing analysts to identify the optimal value of the cost of capital of a company (Investopedia, 2018). Thus, there are three basic forms a firm can select to finance its assets: borrowing, use own profits (versus distribute them to shareholders as dividends), and issuance of shares. In other words, CS is a combination of debt and equity, where equity holders are the owners – having a medium to long-term commitment to the company, expecting to obtain a return on investment as payback (regular dividend or increase in stock price) – and debt holders are the creditors – having a non-long-term commitment, focusing on timely repayment of their borrowings and interests.

¹ also known as the financial crisis of 2007-2008, or the 2008 financial crisis.

Regarding Portugal, there are still few studies addressing to this topic, in particular with regard to the CS of the Portuguese banking, where a significant gap still needs to be filled. Besides, it should be noted that the Portuguese banking have suffered a tough setback in the last decade, which not only caused the collapse of some banks, but also triggered remarkable changes in the capital composition of many others, (exposed to a foreign-led concentration process in the aftermath of the eurozone crisis).

Therefore, the main objective of this research is to examine the CS determinants of the Portuguese banking using a sample of 18 banks for a ten-years period (2008-2017). In addition, the study also aims to increase the knowledge about banking CS and to explore whether they have an aggregated or disaggregated impact on leverage. Our assumption is that the global financial crisis and the eurozone crisis have had a significant impact over the leverage ratios of the Portuguese banks.

1.2. Problem context

1.2.1. The Subprime meltdown

Many economists believe that the US housing bubble was caused by historically low interest rates. The mortgage meltdown began with the bursting of the US housing “bubble” that began in 2001 and reached its peak in 2005 (Bianco, 2008).

In response to the dot-com crash in 2000, the Federal Reserve (Fed) staved off recession in 2001 by lowering the federal funds from 6,5% in May 2000 to 1,75% in December 2001 (Amadeo, 2019). A flood of liquidity ensued and reckless borrowers with no income, job or assets began pursuing their dream of buying a home. Banks were more than willing to help. Easy credit and housing demand increased home prices, making investments in high yielding subprime mortgages resemble a new rush for gold. The Fed continued to slash the interest rates, all the way to 1% in June 2003, the lowest in 45 years (Amadeo, 2019).

Bankers repackage these loans into collateralized debt obligations and sold them to investors. Securities and Exchange Commission (SEC) relaxed capital requirements at five large investment banks freeing them to leverage their initial investment up to 30 or 40 times. Troubles appeared when interest rates started rising. Between 2004 and 2006, the Fed raised interest rates from 1% to 5,25%. Many subprime borrowers could not afford the higher rates and started defaulting. Subprime lenders began finally declaring bankruptcy in 2007. More than

25 during February and March alone. Financial firms and hedge funds owned more than one trillion² dollars in securities that were backed by failing subprime mortgages.

By August it was clear that financial markets could not solve the crisis and problems spread beyond the US central banks. Governments around the world started to work together to prevent a financial catastrophe. The Fed slashed the discount in fund rates, however collapses and bankruptcies persisted. On the 15th of September 2008, Lehman Brothers, the fourth biggest American investment bank declared bankruptcy and the interbanking market practically dried up. The situation urged a resolute intervention by the US government whereas the mistrust hit the pinnacle.

Therefore, as of October 3, 2008, the US government finally enacted the Emergency Economic Stabilization Act, which created a 700-billion-dollar bailout in order to buy distressed assets, including mortgage's backed securities.

Other governments followed with their own bailout packages in response to the crisis global spreading, including the EU which allowed to breach the 3% GDP deficit defined by the Stability and Growth Pact.

1.2.2. From the birth of the Euro to the Eurozone Debt Crisis

On February 7, 1992, the Treaty on European Union – known as well as Maastricht Treaty – was signed, paving the way for the creation of the euro. Aside from establishing significant elements of political union³, the treaty also marked the roadmap to the economic and monetary union that we know today, that ultimately included the implementation of a single and stable currency.

According to the wider concept that originally has created the predecessors' organizations of the European Union (ECC, ECSC and EURATOM), Maastricht was a reinforcement of that central idea of an economic block. Essentially, the idea was to bring countries together in a trade union, using a common currency that eventually would synchronize their economies. On the 1st November 1993, the European Union (EU) was finally formed by the twelve signatory nations – BEL, DNK, DEU, GRC, ESP, FRA, IRL, ITA, LUX, NLD, PRT and GBR – of the Maastricht Treaty succeeding to the EEC and becoming, a couple years later, the second largest economy in the world.

² One Trillion: 1,000,000,000,000

³ **First Pillar:** the European Communities (EEC, ECSC and EURATOM); **Second Pillar:** a common foreign and security policy; and a **Third Pillar:** cooperation on justice and home affairs (European Union, 2018).

In order to enable countries to share the same currency, the treaty limited for the first time in EU history public debt levels to 60% and deficits to 3% of GDP (European Commission, 1995-2018). Economists and politicians looked to the past growth record and considered it reasonable to assume a 5 percent annual nominal GDP growth rate in European countries. If economic growth was maintained at the level public finances would be sustainable (Pereira & Wemans, 2012).

Even though all the previous steps taken to materialize the introduction of the Euro on January 1, 1999 – including the creation of the ECU⁴ on 13 March 1979 – critics warned of crucial flaws in its complex structure. On its basis, the eurozone is composed by very diverse economies, each one with its own deficit, different constitution and fiscal policies, even though sharing a single interest rate set by a unique Central Bank (European Central Bank – ECB). At this stance, economic situation in a certain country could suddenly deteriorate leaving no option than austerity in the absence of monetary instruments to influence macroeconomic indicators.

In this context, until 2010 markets just assumed that eurozone countries were pretty much similar in terms of risk. As a result, countries such as Greece (which always had paid high interest rates), Portugal, Ireland, Spain or Italy, could issue government bonds with an interest rate as low as the interest rate demanded by markets for German bonds independently their high public debts grown since euro's adoption (see Figure 1).

⁴ The ECU (European Currency Unit) was the first official monetary unit of the European Monetary System (EMS) before Euro's introduction. On itself, the ECU consisted on a basket of the 12 EU member states currencies weighted according to each country's share of EU output. The main purpose was to reduce exchange rates variability and achieve monetary stability in Europe prior to the introduction of the Euro, at parity, on 1 January 1999 (Investopedia, 2018).

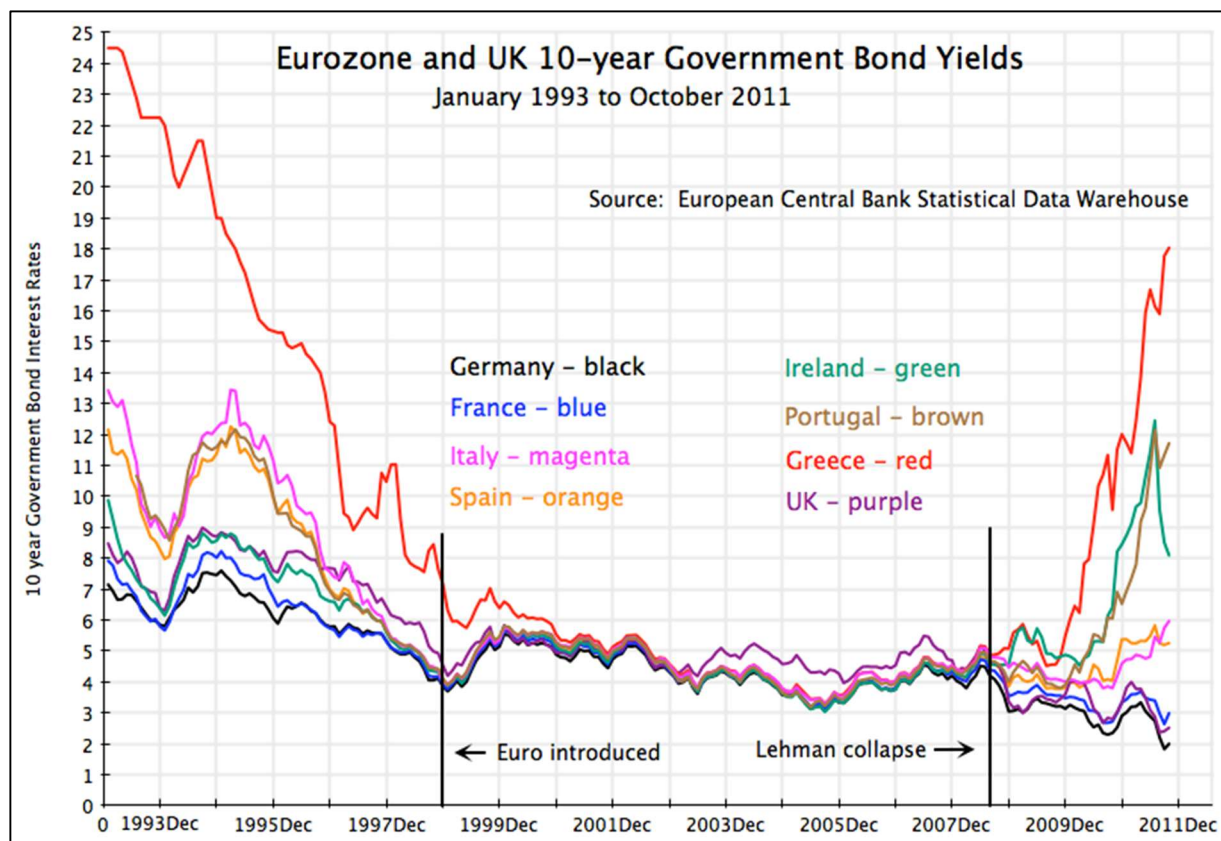


Figure 1 – Eurozone and UK 10-year Government Bond Yields, January 1993 to October 2011
 (Source: ECB Statistical Data Warehouse in Lysy, 2011)

However, after the credit crisis bubble burst in the US in 2008, nearly two years later the financial crisis mutated into a fiscal crisis which dragged the whole eurozone down exposing the structural defects of European Monetary Union (EMU). Aware of the risk of financial and economic meltdown, central banks and governments in the EU embarked on massive and coordinated policy action. Financial rescue policies have focused on restoring liquidity and capital of banks and the provision of guarantees so as to get the financial system functioning again (European Commission, Directorate-general for Economic and Financial Affairs, 2009).

Beyond that, as of November 2008, EU’s Government leaders agreed on the need for a coordinated response in order to avoid a deep recession in the EU asking European Commission (EC) to present proposals for discussion. The final result was a range of expansionary fiscal stimulus measures within the framework of the European Economic Recovery Plan (ERRP) endorsed by the European Council on 11-12 December 2008. In the total, the fiscal stimulus measures amount to 1.1% and 0.8% of GDP in the years 2009 and 2010, respectively. These fiscal measures have been implemented in addition to the stimulus provided through the operation of automatic fiscal stabilizers and do not include other extra budgetary actions such as capital injections, loans and guarantees to the financial sector, as well as investment by public corporations (Coenen et al., 2012). According to Trigo Pereira and St. Auby, the settled policy

had eventually helped to deepen the sovereign debt crisis in those countries with higher deficits and public debts (Trigo Pereira & St. Aubyn, 2011), opinion corroborated by Coenen: *“the EERP alone does not account for the total discretionary fiscal stimulus in the eurozone, lastly it has led to a considerable increase in governments deficits and debt levels”* (Coenen et al., 2012).

Notwithstanding, on the verge of Euro’s 10th anniversary, while some were still arguing that the Euro had abolished economic crises, signs of a financial downturn over eurozone start emerging.

The eurozone crisis arose when large capital flows from the core to the periphery of EU which had built up since the introduction of the euro, suddenly reversed in 2009-2010. Without a currency to depreciate between different regions of the eurozone, the large and sudden contraction in the current account deficit required a large contraction in domestic consumption and investment, driving these economies into recession (Reis, 2015).

The first signs of alarm have soared in 2009 after an enormous hole in Hellenic public finances was revealed. Greece’s budget deficit reached 15,4% of its Gross Domestic Product (GDP). Moreover, revelations that previous Greek governments underreported the real data on debt levels led to a crisis of confidence rising spreads on Greek bond yield over all maturities. Fears rapidly spread that debt levels and fiscal positions of a sort of eurozone countries were unsustainable, making it harder for these countries to finance their budget deficits while facing an overall low economic growth. Due to crucial flaws on Euro framework conception, markets realized EU neither had the adequate mechanisms to respond to the Greek crisis nor the eurozone countries were harmonized to respond jointly in case of an emergent troubled country. Therefore, following a request for international financial assistance from Greece, on May 2010, the EC, the International Monetary Fund (IMF) and the ECB, agreed on a 110 billion euros bailout through the first established Economic Adjustment Program for Greece. Implications of the Greek crisis extended well beyond Greece and the bailout package that Greece received was large partly because of fears of contagion to other countries in the eurozone and to their banking systems (Gourinchas et al., 2016).

Anticipating further needs of finance liquidity in some jeopardized countries, the European Financial Stability Facility (EFSF) was established on June 2010, until it has been succeeded by the European Stability Mechanism (ESM) in October 2012.

After Greece, other countries also requested financial assistance. By November 2010, a rescue package of 85 billion euros was assigned to Ireland by the EFSF, which was followed by a 85 billion euros bailout conceded to Portugal on May 2011 under the same facility.

Yet, by 2012 eurozone crisis was still far from over when significant imparities on Spanish banking forced a bailout by the European Stability Mechanism (ESM) providing up to 100 billion euros to rescue Spanish banks. Lastly on March 2013, Cyprus also agreed an adjustment program with EC, ECB and IMF in exchange of financial envelope of 10 billion Euros. During this time, Italy also felt the effects of overwhelming interest rates in some extent but was able to avoid financial aid request.

By mid-2012, it was noticeable that the eurozone was split in two: Ireland and the Mediterranean countries on one side – labeled as PIIGS⁵ (or euphemistically GIPSI) – and the main core of eurozone (Germany, Austria and Netherlands). Thus, it would not be before the announcement of the President of the European Central Bank, Mário Draghi, on September 6, 2012 – stating that ECB would do “whatever it takes” to preserve the common currency – that the eurozone would be freed from the risk of failure.

1.2.3. Regulatory policy evolution

Banks can impose major risks on the economy. Avoidance of these risks and the associated costs is the overwhelming concern of prudential regulation (Hugonnier & Erwan, 2017). Thus, in the 1970s, it was recognized that banking had to be supervised and as of 1974, was founded the main regulatory institution on banking – the Basel Committee on Banking Supervision (BCBS) – mostly known for issuing the regulatory norms known as Basel rules.

Since then, the purpose of these norms has been the improvement of the worldwide Bank regulatory framework. However, BCBS reglementary norms do not have legal force. Rules’ implementation depends on members enactment in each country, although BCBS has the following responsibilities: 1) facilitate collaboration and discussion between Central Banks; 2) facilitate interaction amid financial authorities; 3) analyze policies taken over significant problems for the monetary strategy and financial stability; 4) perform as main support element for financial transactions in support of central banks.

The first Basel set of rules, known as Basel I, were enacted in 1988 and refers to the first combined international effort to assess risk relative to bank capital. The main objective was to improve bank stability through strong norms and supervision during a time of increasing bank values and bankruptcy risks. Primarily, Basel I focused on credit risk and appropriate risk-

⁵ PIIGS, abbreviation for: Portugal, Ireland, Italy, Greece and Spain.

weighted of assets (RWA⁶). Thus, it weighs the capital that a Bank owes to the credit risk defined by Basel I, asserting the bank capital ratio required by banks to maintain a minimum ratio of total capital to RWA of 8%. Basel I outlined two Tiers of Bank capital. Tier 1, which includes issued stocks and declared reserves and Tier 2, which consists of supplementary capital to include gains on investments, long term debt and hidden reserves. At the same time, Basel I also created a Bank asset classification system decomposing banks into five risk categories classified by percentages (0%; 10%; 20%; 50% and 100%). By grouping a bank's asset through the nature of each debtor, banks are placed into a category depending on the debtor⁷.

In 2004, more than a decade later, the second set of international banking rules passed by the BCBS were published aiming to supersede Basel I accords. Basel II aimed on strengthening the capital requirements of Banks by establishing three goals: 1) make a bank's capital more risk sensitive; 2) promote enhanced risk management tactics among larger banks; 3) create a common means for evaluating banks from one to another.

In this sense, Basel II extended Basel I rules concerning minimum capital requirements and by establishing requirements for evaluation of capital adequacy of banks. Basel II also identified three pillars for assessing bank performances: 1) calculate minimum capital requirements; 2) identify risk factors not captured in pillar one; 3) assess information pertaining to risk management and distribution. The accords of Basel I and Basel II produced agreements that helped to improve the international banking sector, measurement and management of financial and economic stress. Moreover, previous Basel I and II accords also helped banks to better measure and manage risk and improve bank reporting and transparency.

The evolution of prudential regulation over the past three decades has largely been the reflection of the growing complexity and globalization of the banking sector supported by a

⁶ RWA – consists in a method to measure the exposure risk of a bank's assets. The RWA determines the Capital Adequacy Ratio ($\frac{\text{Tier 1 Capital} + \text{Tier 2 Capital}}{\text{Risk-Weighted Assets}}$) and the capital required for the bank. Therefore, RWA are risk management tools, calculating the capital requirement based on a risk assessment performed according to each type of asset, expressing the risk of operations carried out by the financial institution, and the minimum amount of capital to be held in order to reduce risk of insolvency. The greater the amount of risky assets a bank has, the higher the Capital Adequacy Ratio, and thus the highest the capital requirements.

⁷ 1) Cash, Central Bank and Government Debt and any OECD Government Debt – 0%; 2) Public Sector Debt – 0%, 10%, 20%, or 50%; 3) Development Bank Debt, OECD Bank Debt, OECD securities firm debt, non-OECD Bank Debt and non-OECD Public Sector Debt, Cash in collection – 20%; 4) Residential mortgages – 50%; 5) Private Sector Debt, non-OECD Bank Debt, real estate, plants and equipment, capital instruments issued at other banks – 100% (BaselCompliance.net, 2017).

climate of widespread confidence and optimism until the summer of 2007, when the aftermath of the subprime crisis and subsequent events have shaken this atmosphere (Banco de Portugal, 2016).

Following the 2008 financial crisis, in recognition of the need for banks to improve their liquidity management and financial stability, the BCBS developed an international framework for liquidity assessment in banking in addition to more stringent capital adequacy rules (Roulet, 2018). In result, in 2011 a third series of accords – known as Basel III – were issued by the Basel Committee. The focus of Basel III came over individual banking with emphasis on bank's liquidity coverage ratio, net stable funding ratio, the establishment of liquidity management supervision principles and monitoring metrics. It is believed that this new framework will help individual banks better absorb financial shocks and contribute for a more resilient banking system by avoiding the surge of systemic risks. Originally published in 2011, along with an implementation phase-in (2013 to 2015), adjustments postponed the start date to 2019.

In the Basel III framework, total regulatory capital is defined as the sum of Tier 1 capital, with the predominant form being common shares and retained earnings, and Tier 2 capital. The latter consists of various elements such as capital instruments not included in Tier 1 capital and which meet the criteria for inclusion in Tier 2 capital (van Rixtel & Gasperini, 2013). Accordingly, Tier 1 Capital is primary funding source for a bank, while Tier 2 – composed by: revaluation reserves, hybrid capital instruments and subordinated term debt, general loan-loss provisions, and undisclosed reserves – due to nature of its elements, is considered less reliable, because it is more difficult to accurately calculate and to liquidate.

1.2.4. Brief characterization of the Portuguese banking

In the last four decades, the Portuguese banking system has observed deep transformations. The sector, which had counted nearly five dozen financial institutions by 1974, nowadays is reduced to less than twenty – many of them only branches of headquartered institutions based in foreign countries (Forbes Portugal, 2018). 2015 marks the fortieth anniversary of banking nationalization after the fall of the dictatorship regime in 25th of April 1974. Until the revolution in 1974, all the banks operating in the country were private – including the issuing banks: Banco de Portugal, Banco de Angola and Banco Nacional Ultramarino. The sole exception was Caixa Geral de Depósitos, publicly owned. By March 1975, all banks were nationalized, only remaining in the private sector three foreign-funded institutions [Banco do Brasil, the Bank of London & South America and the Crédit Franco-Portugais (Nunes et al., 1994). Previously, in September 1974, Banco de Portugal had been also

nationalized and its functions and statutes were redefined by an organic law, published on November 15, 1975, assigning the status of central bank and the function of supervision for the first time (Banco de Portugal, 2019).

It took approximately a decade to private initiative regain control over Portuguese financial sector. A change that cannot be dissociated from Portugal's adhesion to the European Economic Community (EEC) on 1st of January 1986. The perspective of integration in a single market freed of borders and globalized, encouraged governments to reprivatize banking industry and to unfold a liberalization process presaging a new market-driven environment.

Mendes & Rebelo (2003) have remarkedly synthesized the above-mentioned transformations: "banking industry was reopened to private initiative in 1984; administrative interest rates were progressively abolished in the second half of the eighties; re-privatization of formerly nationalized banks took-off in 1989; bank credit ceilings were abolished in the early nineties. As a result of the increasing number of institutions, bank concentration indexes fell, albeit slightly. Meanwhile, financial markets were reorganized, particularly the capital markets, and deregulation of financial products and services was implemented. Full liberalization of interest rates and capital flows occurred in 1992. Harmonization of prudential regulation was implemented during 1990-95. The 1993 European single market for financial services was another determinant of the financial liberalization process occurred in Portugal."

By 1994, the banking sector had significant concentration degree, with the three largest banking groups holding 61% of market share and the five larger holding 77% (Alves & Tavares, 2017). Notwithstanding, from 1995 to 1999, Portuguese banking was marked by noteworthy merging operations. Among those we highlight the acquisition of Banco Português do Atlântico (BPA) in 1996 by Banco Comercial Português (BCP) – which also assimilated Banco Pinto & Sotto Mayor and Banco Mello in 2000 – and, in 1998, the operation which have united three important banks (Banco Fonecas & Burnay, Banco de Fomento e Exterior and Banco Borges e Irmão) creating Banco Português de Investimento (BPI), the largest single branded network in Portugal at this time (Banco Português de Investimento, 2002).

Once the concentration operations had come to halt, a new paradigm on banking management emerged and prolonged during the next decade. This new paradigm was based on a strong credit expansion, facilitated by a sturdy economic growth in the context of convergence to the Euro, and enhanced by a significant decline in inflation and interest rates. Therefore, until the beginning of the financial crisis (2007), the monetary scenario of low interest rates and exchange rate stability, combined with an increase in available income, favored this rapid expansion of credit (Tavares & Capucho, 2001 in Alves & Tavares, 2017, p. 39). In addition,

the referred authors also unfold the surge of a perilous gap by 2000 when the Loan-to-Deposit Ratio (LDR⁸) surpassed the 100% – reaching a percentage close to 115% in that year – revealing a fast-external indebtedness of the Portuguese banking system. LDR increased almost continuously since 1998, peaking at 162.0% by the end of 2009, corresponding to a period of substantial credit expansion (see Figure 2). However, increase in lending is usually a good advanced indicator of bank risk and is generally associated with a relaxation in credit standards and a deterioration in the quality of balance sheet assets.

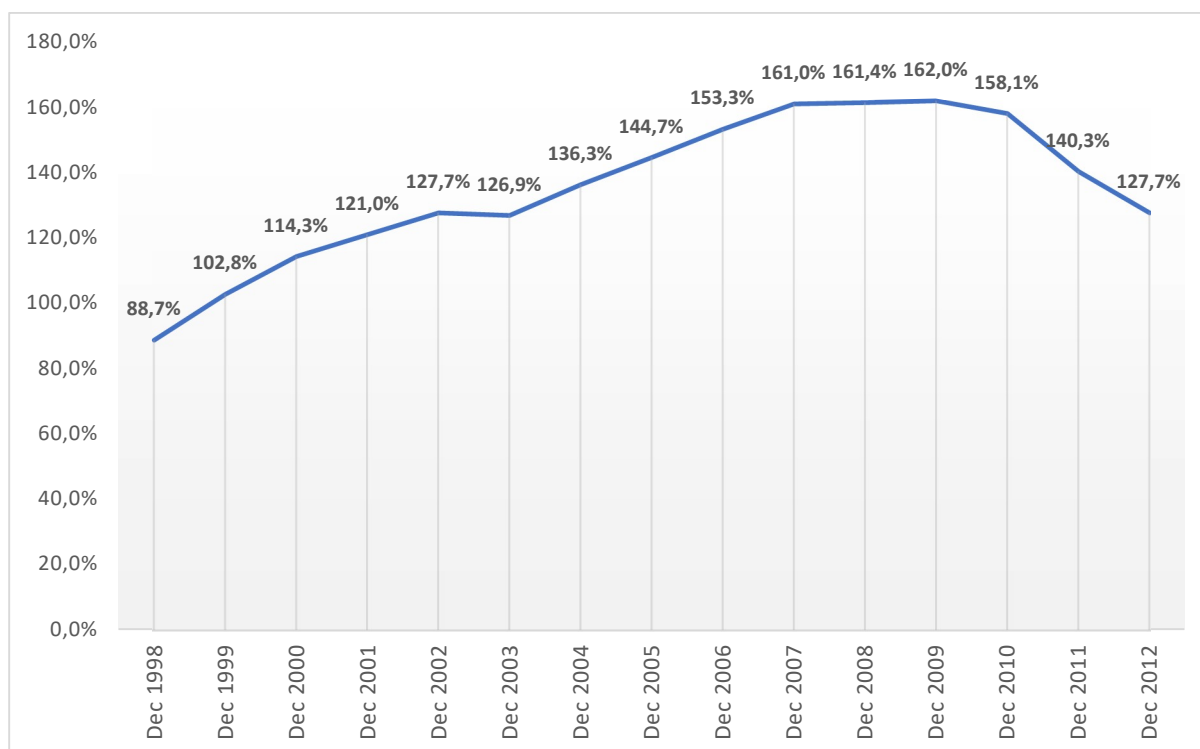


Figure 2 – Evolution of the Loan-to-Deposit Ratio (LDR) for the Portuguese banking
(Source: BdP, 2014 in Cardão-Pito & Baptista, 2017)

From 2000 to 2007, Portuguese economy turned into a “slump”, with massive capital inflows being mis-allocated. This has led to an expansion in unproductive non-tradable sectors, without significant gains in productivity (Reis, 2013). By the same time, Portuguese banking was focused in gaining market share through credit expansion. In consequence, credit to GDP ratio reached 115% by 2000, 144% in 2005 and close to 160% by 2010 (Alves & Tavares,

⁸ LDR – this ratio shows the percentage of a bank’s loans that the bank funds with deposits. Banks need to maintain a certain amount of liquidity to handle withdrawals and conduct business. Thus, LDR assess a bank’s liquidity, signaling if a bank can cover its obligations. If a bank’s LDR percentage is too high it means the bank may not have enough liquidity to cover any unforeseen fund requirements. The higher the ratio the more the bank relies on borrowed funds. Conversely, a low LDR means the bank is at lower risk of covering fund requirements. However, a low ratio also can mean that a bank may not be earning as much as it could be.

2017), making national banking very dependent on market financing. Not surprisingly, when the subprime crisis hit the world financial system as an earthquake by 2007, one of the most difficult periods for banks and the Portuguese economy in recent decades was just about to begin.

One consequence of the rapid growth of banking credit was the decrease of the Portuguese banks' solvability to low levels in comparison to other European countries. From 1997 to 2010, the capital adequacy ratios of Portuguese banks have decreased considerably. Initially, the decline was explained by the rapid growth of credit, and later on the period, by losses originated by the crisis and difficulties in raising capital. Consequently, in 2008 and 2010, Portuguese banks had one of the lowest levels of regulatory capital of the euro area (Lagoa et al., 2013).

In following years, several measures were taken aiming to improve solvency ratios of the Portuguese banks: (1) according to a recommendation of the Bank of Portugal (BdP) – that Tier 1 Capital ratio should be above 8% – Portuguese government announced on 2nd of November 2008, a recapitalization plan for credit institutions up to a total of 4 billion euros; (2) at the beginning of April 2011, the BdP replaced the previous recommendation into a requirement that the Core Tier 1 ratio should be 8%; (3) in May 2011, following the signature of the Economic and Financial Assistance Program (EFAP), the minimum for Core Tier 1 was revised from 8% to 9%, to be complied until the end of 2011 and to 10% by the end of 2012. Moreover, there have been also a reinforcement of the policy to assess the solvency of the banking system, including the implementation of stress tests on the eight major banking groups.

Besides these general measures, Portuguese authorities had also to deal with some complex situations since the beginning of the GFC. Banking bankruptcy and alteration in the composition of Portuguese banks' capital, marked the ensuing years to come in the Portuguese banking system.

On November 05, 2008, BPN was nationalized in order to secure depositors money, following strong suspicions of irregularities and inability to meet obligations. Until the privatization on December 09, 2011, the bank costed to taxpayers more than 4 billion euros in State support, in stark contrast to the 40 million euros obtained three years later in a sale agreement with BIC (an Angolan funded bank).

A few days later, on December 01, the BdP decides to intervene on BPP through a rescue plan which includes a negotiated loan with six other banks (CGD, BES, BCP, BPI, Santander Totta and Crédito Agrícola) which granted a credit line of 446,5 million euros to the rescued bank under the guarantee of Portuguese State. Notwithstanding, in 2010 the banks executed the

guarantee and the Portuguese State became the single creditor to BPP, which was already on its way to liquidation.

As of December 31, 2012, the government announces BANIF recapitalization through the injection of 1100 million euros, making Portuguese State the main shareholder with 98,7% of the shares. However, three years later, on December 20, 2015, the BdP announces the acquisition of BANIF by Santander Totta (the entity which represents the Spanish financial group Santander in Portugal) for 150 million euros.

As of August 05, 2014, the BdP announces the resolution on BES, following the release of the first semester results of 2014 (3577,3 million euros) which unveiled the practice of mismanagement acts as well as the break of BdP determinations prohibiting an increase on exposures to other entities of the Espírito Santo group. As a result, two separated entities were created: the former BES (holder of the “toxic” assets) and Novo Banco (a new formed commercial bank that kept BES's deposits and “non-toxic” assets, capitalized with a 4,5 billion euros injection by the Resolution Fund⁹). Three years later, as of October 18, 2017, it was announced the agreement with Lone Star Fund (an American private equity firm) to sell 75% of the shares of Novo Banco, while the remaining 25% stayed in the hands of the Resolution Fund.

Among the set of Portuguese banks that switched ownership, BPI has been the very last one to be acquired by a foreign institution. On February 2017, the Catalan group CaixaBank successfully concludes a takeover bid for BPI's shares, closing the deal with 84.52% of the bank capital (which compares to the 45.5% previously held). By December 2018, the remaining shares were also been acquired by CaixaBank through a potestative acquisition, thus becoming the owner of 100% of the shares.

1.3. Aim and Research Questions

The general purpose of this study focuses on evaluating how strongly common CS determinants have an explanatory power over CS of the Portuguese banking. In order to achieve this goal, the set of banks selected correspond to the group of financial entities that together form the Portuguese Bank Association (APB¹⁰). At this point, we also have granted that the

⁹ The Resolution Fund was created in 2012 with the mission of providing financial support to the resolution measures that could be implemented by the BdP as national resolution authority (Fundo de Resolução, 2017).

¹⁰ APB – Associação Portuguesa de Bancos

selected firms have continually operated as a unique entity during the analyzed period (2008-2017).

We also investigate the effect of the GFC crisis and the eurozone sovereign debt crisis on banks' equity capital and whether the determinants of CS have the same effect during this period. To this end, we use a dummy variable that takes the value of one for the years of the international financial crisis and the eurozone sovereign debt crisis (2008–2012) and zero otherwise.

This study will add value since it is the first to address the topic of CS determinants of the Portuguese banking industry. In this scope, our research questions are formulated based on the findings of previous studies and can be summarized as follows:

- RQ1: Do the standard determinants of corporate CS also apply to Portuguese banks?
- RQ2: What is the relation between the regulatory capital and Portuguese banks' CS?
- RQ3: Has the GFC and the eurozone crisis had any impact on the CS of Portuguese banks?

1.4. Methodology

The study steers a positivist research approach, comprising the existence of an autonomous reality which is either independent from the searcher perspective and its personal beliefs. In this sense, the study will preferentially be based on quantitative data (regardless some qualitative and empirical elements concerning the sector and the overall economic period framework). By using this approach, the author will be able to validate the investigation hypotheses and the empirical knowledge about the investigation problem through statistical and mathematical methods. This approach is frequently used by investigators when studying firms' Capital Structure determinants.

The study-sample, it is made up of a group of 18 Portuguese banks, listed in the 2017 Portuguese Banks Association (APB) Statistical Bulletin, which since 2008 has presented annual reports as autonomous tax entities. The collection of data was done on the basis of the individual financial statements of each bank for the years comprehending the period from 2008 to 2017.

The analysis of the data will be conducted through descriptive statistics, bivariate correlation by using the Statistical Package for Social Sciences (SPSS) and a multiple linear regression model by using STATA version 16, in order to achieve the goals defined in this study.

1.5. Structure of the Thesis

This dissertation structure is organized as follows: Chapter 1 presents an introduction to the subject, followed by the theoretical framework on Chapter 2. Chapter 3 comprises a review of the core existing CS literature mainly related to banking sector. On the fourth Chapter, we describe the used methodology to achieve the investigation objectives as well as the development of hypotheses. Chapter 5 reveals the results obtained and the correspondent analyses, and finally, on Chapter 6 we address the conclusions, limitations of the study, and few suggestions for further investigations.

2. Theoretical Framework

CS is still a non-consensual theme among scholars. The very first approach to Capital Structure, was made by David Durand in 1952 with the article: *Costs of Debt and Equity Funds for Business: Trends and Problems of Measurement*. Using the Net Income (NI) approach, Durand stated that a firm can decrease its cost of capital and consequently increase the value of the firm through debt financing (Abeywardhana, 2017). By other words, Durand claimed that by increasing the debt ratio, CS increases while weighted average cost of capital (WACC¹¹) decreases resulting in a higher firm value.

Despite there is no universal theory regarding equity-debt choice, financing clearly matters. The chief reasons why it matters include taxes, differences in information and agency costs. Theories of optimal capital structure differ in their relative emphases on, or interpretations of, these factors. The trade-off theory emphasizes taxes, the pecking order theory emphasizes differences in information, and agency costs theory emphasizes conflicts of interests between different stakeholders of the firm (Myers, 2001).

In the following section we attempt to make an essential review of the main theories, from the CS irrelevance theory of Modigliani and Miller (1958), to the most recently introduced, the

¹¹ WACC – it is a measure of a firm's financing costs, calculated as the weighted average of each type of financing (debt and equity), that proportionally the firm has taken on. Debt and equity are the two components that constitute a company's capital funding. Since the cost of the capital is the return that equity owners and debt holders will expect, WACC indicates the return that both kind of stakeholders (equity owners and lenders) can expect to receive (Investopedia, 2018). Thus, WACC's formula is expressed by the following formula:

$$WACC = \frac{E}{V} \times Re + \frac{D}{V} \times Rd \times (1 - Tc)$$

Where: Re – Cost of Equity; Rd – Cost of Debt; E – market value of the firm's Equity; D – market value of the firm's Debt; V=E+D – Total market value of the firm's financing (Equity and Debt); E/V – percentage of financing that is equity; D/V percentage of financing that is Debt; Tc – corporate tax rate.

market timing theory of Baker and Wurgler (2002). Although each of these theories sounds plausible, last empirical studies have shown that CS do not follow one single theory, sustaining that companies take a target leverage ratio during a certain period of time pursuing it consistently.

2.1. Capital Structure Irrelevance Theory of Modigliani and Miller

Financial theory in the recent decades has gradually developed more complex theories of the capital structure optimization, which are necessary theoretical and methodological basis for the management of liabilities (Jaros & Bartosova, 2015). In the mainstream of the academic field of finance, the Modigliani and Miller's (1958) proof of capital irrelevance theory, has been praised as the cornerstone of the modern scientific finance (Ardalan, 2017). However being considered as the starting point of modern theory of capital structure (Abeywardhana, 2017), the CS irrelevance theory is based on a set of assumptions which are both unrealistic and contradictory to the mainstream academic finance (Ardalan, 2017). According to this theory, firm value is based fundamentally on its ability to earn revenue, plus the risk of its underlying assets, regardless of the firm's CS. In other words, the value of a company is independent of how the company distributes its profits as dividends to the shareholders or how it finances its operations. Accordingly, the way a company finances its operations should not affect its market value which is determined by its underlying assets and earning power (independently from its leverage ratio).

As mentioned above, capital structure irrelevance theory was theoretically very sound (Abeywardhana, 2017) but was based on the following unrealistic set of assumptions (Ardalan, 2017):

- (1) Capital markets are frictionless.
- (2) Individuals can borrow and lend at the risk-free- rate.
- (3) There are no costs to bankruptcy or business disruption.
- (4) Firms issue only two types of claims: risk-free debt and equity.
- (5) All firms are assumed to be in the same risk class.
- (6) Corporate taxes are the only form of government levy.
- (7) All cash flow streams are perpetuities.
- (8) There are no signaling opportunities.
- (9) There are no agency costs.
- (10) The operating cash flows are completely unaffected by changes in capital structure.

Therefore, Modigliani-Miller (M&M) theorem led to plenty of research on capital structure devoted to tackle irrelevance as a matter of theory or as an empirical matter (Luigi & Sorin, 2009). The research has shown that a number of assumptions underlying this theory fail in real world circumstances. Far from factual economy realm, the theorem only holds true if markets are completely efficient and thus presupposing certain ideal conditions such as: absence of asymmetry of information, no taxes or bankruptcy costs, no agency costs neither transaction costs; all firms operating in similar risk classes (independently of the sector), investors and companies have the same conditions to credit and access to the same interest rates (equivalence of borrowing costs).

In order to turn it more accurate, Modigliani and Miller, in 1963, incorporated the effect of tax on cost of capital and firm value. Becoming known as proposition II, they claimed that in the presence of corporate taxes, the firm value increase with the leverage due to the tax shield. However, contrasting with Durand's theory, the WACC of the firm would remain constant as cost of debt compensate with higher cost of equity. The explanation is simple: an increase in leverage rises the risk of the firm which results in an equivalent increase of the cost of equity.

2.2. Trade-Off Theory

The original version of the trade-off theory grew out of the debate over the Modigliani-Miller theorem. When corporate income tax was added to the original irrelevance, this created a benefit for debt in that it served to shield earnings from taxes (Luigi & Sorin, 2009). According to this theory, optimal CS normally requires a trade-off, in this particular between the tax advantages of borrowed money and the costs of financial distress when the firm finds it has borrowed too much (Shyam-Sunder & Myers, 1999). Therefore, trade-off theory postulate that all firms have an optimal debt ratio at which the tax shield equal the financial distress cost (Abeywardhana, 2017). Tax benefit of debt causes a company's value to increase, as leverage is raised, only to some extent. While leverage increases, so does the likelihood of default. The cost of financial distress eventually becomes so great that it erodes the benefits of the tax shield, and firm value begins to decline. Implicitly, it means that there is an optimal level of debt beyond which firm's value declines as a result of a higher risk of default.

Although the revised M&M theory was an improvement by virtue of it incorporating the tax benefits of debt, it still failed to address the costs of financial distress. Trade-off theory built upon M&M, and addressed the impact of financial distress on the capital structure decision. The underlying premise of trade-off theory is that a firm will identify an optimal target CS that they believe balances the benefits of the tax shield against the costs of financial distress. A

value-maximizing firm would equate benefit and cost at the margin, and operate at the top of the curve in Figure 3 – The static tradeoff theory of optimal capital structure assumes that firms balance the marginal present values of interest tax shield against the costs of financial distress

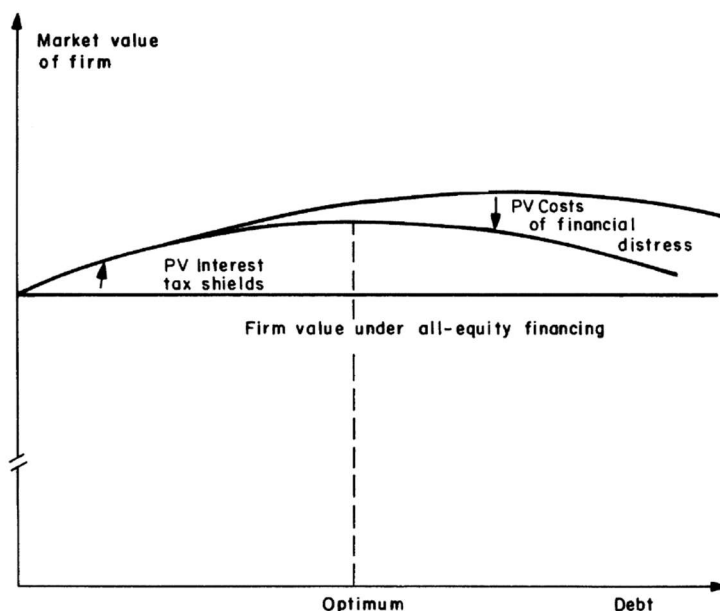


Figure 3 – The static tradeoff theory of optimal capital structure assumes that firms balance the marginal present values of interest tax shield against the costs of financial distress (*Shyam-Sunder & Myers, 1999*).

A number of dynamic trade-off theories emerged in the 1980s to support the empirical findings that despite the appearance of target CS, a firm’s CS varies over time. They maintain that even though CS may diverge from a target, firms aim for a CS that they believe is optimal. Many forms of dynamic trade-off theories exist. Some attribute deviations from target levels of leverage to various exogenous factors including the accumulation of profits, investment expenditures, and changes in market prices. Others attribute the deviations to deliberate actions taken by managers to time the market. Dynamic trade-off theories often include considerations of transaction costs, and suggest that as CS fluctuates, managers will act to move the CS back toward a target structure only when the costs of not doing so exceed the transaction costs of rebalancing.

Trade-off theory recognizes debt as a factor that generates advantages for the company, resulting from the tax savings it provides, if the company has the capacity to generate results that allow the use of said tax savings. On the other hand, it recognizes that, despite the advantages provided by debt through tax savings, from a certain level debt increases the risk of insolvency and, consequently, insolvency costs arise, negatively influencing its value. In addition to enhancing the existence of insolvency costs, it also leads to the emergence of 'agency

costs', resulting from conflicting interests between shareholders and creditors, including, among other cost sources, the expenses that creditors incur in overseeing shareholders in order to safeguard their financial interests.

2.3. Pecking Order Theory

Pecking order theory has emerged as an alternative to the trade-off theorem. The basis of pecking order theory is founded on asymmetry of information. The key assumption is that the cost of financing increases when the degree of asymmetric information rises. In general, managers have more information about firm's performance, risks and prospective issues than external stakeholders, including creditors and investors. Depending on certain factors – activity sector, accounting transparency, business complexity, etc. – asymmetry of information can be higher or lower, but there will always be some amount of information asymmetry in every company. Thus, the greater the asymmetry degree, the higher will be the incurring costs to issue debt or equity. For this reason, retained earnings are many times a cheaper and convenient source of finance than external ones.

The pecking order model says that the choice of CS is not based on a target CS nor is influenced by tax shields or bankruptcy costs. Instead, CS options reflect the tendency of firms to prefer financing new projects with internal funds and issuing debt, rather than equity when external financing is necessary. Hereupon, when a firm's internal cash flows are inadequate for its real investment and dividend commitments, the firm issues debt. Equity is never issued, except possibly when the firm can only issue junk debt and costs of financial distress are high (Shyam-Sunder & Myers, 1999). This inclination to avoid external finance, is motivated by management's desire to prevent the scrutiny of capital markets and the costs associated with information asymmetries. In general, equity is considered to be particularly sensitive to information asymmetries since the market knows that a firm is unlikely to issue equity if it believes its stock to be undervalued. The market thus views the issuance of equity as a signal that the stock is overvalued, and responds by driving the stock price down. This effect is amplified by the fact that the market may be unsure about the firm's future prospects and what the firm plans to do with the newly raised equity capital. Under such circumstances, pecking order theory stresses that firms would first prioritize the use of internal funds, followed by debt and finally new equity. Thus, companies tend to prioritize their own sources of financing and lastly raising equity. As companies need more and more capital, it becomes increasingly hard to obtain such funding internally forcing them to resort to bank debt or public equity (usually more expensive).

2.4. Agency Theory

Jensen and Meckling postulated a theory in 1976 based on the analysis of the conflicts originated by the divergence of interests directly participating within a company. For the authors, the organization can be understood as a network of contracts, whether explicit or implicit, which set out the functions and define the rights and duties of all its stakeholders. From these relationships arise the 'principal' and 'agent' figures: The principal is who (at any hierarchical level or for the organization as a whole) sets a certain goal, while the 'agent' is the one to whom the 'principal' delegates decision-making power as a mean of achieving the stated goal. Under this perspective, agency theory identifies two types of conflicts: a) conflicts between managers and shareholders, and b) disputes between debt holders and equity holders.

Regarding the first, corporate managers, the agents, will act in their own interests, and will seek higher-than-market salaries, perquisites, job security and, in extreme cases, direct capture of assets or cash flows. They will favor “entrenching investments” which adapt the firm’s assets and operations to the managers’ skills and knowledge, and increase their bargaining power vs. investors (Shleifer and Vishny, 1989 *in* Myers, 2001). Interests divergencies between managers and shareholders can be reduced by designing compensation packages awarded to firms’ executives. Among these practices are stock options attributed to managers or executive compensation in part to shareholders return.

Concerning the second type, conflicts of interest between shareholders and creditors arise from asset substitution. Sometimes shareholders are encouraged to exchange their assets for more competitive assets that will represent higher returns but have associated higher risk. When it comes to high risk projects, lenders seek to prevent such exchange by predicting that the investment may not have the expected return and/or the company may not be able to settle its debt to its creditors. This conflict of interest also creates an additional cost for lenders who will have to analyze whether the company has a track record of good projects and debt repayments, including through collecting and analyzing information.

Thereby, agency costs are composed by three elements: (i) the opportunity cost associated with wealth reduction when there are disagreements between shareholders and managers; (ii) control costs of managers' activities, such as audits and other types of controls; (iii) bankruptcy and restructuring costs of the company. These costs may be such that they directly influence the CS of firms and may compromise the creation of value.

As such, to a certain point, agency costs and trade-off theories are inter-related, since a firm determines its CS by trading off the tax advantage of debt against the costs of financial distress of too much debt, and, the agency costs of debt against agency cost of equity (Luigi &

Sorin, 2009). According to Jensen and Meckling, the optimal CS is achieved by striking a balance between reducing bankruptcy costs and the amount of indebtedness, as debt, in addition to providing tax gains, also reduces conflict of interest between managers and shareholder, because the flows generated by the operating activity will have to settle interest and debt amortization, leaving less free resources so that the managers can somehow make personal use of them.

2.5. Market Timing Theory

Market timing theory explains that firms issue new equity when their share price is overrated and they buy back shares when the price of shares are underrated (Baker & Wurgler, 2002 in Abeywardhana, 2017).

There are two versions of this theory: the first, which considers economic agents as rational, and a second one, which assumes irrationality of economic agents. According to the first version, a reduction in information asymmetry coincides with a rise in stock prices. Inversely, second version claims that due to irrational behavior, managers issue equity when they believe its cost is irrationally low and repurchase equity when they believe its cost is irrationally high (Luigi & Sorin, 2009).

This implies fluctuations in the price of shares affecting the corporate financing decisions and lastly the CS of the firm. By using the market-to-book ratio, Baker and Wurgler, (2002) have found that *“low-leverage firms tend to be those that raised funds when their valuations were high, and conversely high-leverage firms tend to be those that raised funds when their valuations were low”* signaling persistent effects on CS for at least a decade.

In accordance to this theory, there is no optimal CS, so market timing financing decisions just accumulate over time into the CS outcome (Baker & Jeffrey, 2002).

3. Literature Review & Development of Research Questions

3.1. Banks' Capital Structure

Literature on banking CS, is not as much vast as the studies dedicated to the same topic regarding non-financial firms. Nevertheless, it is important to note that banking sector has some specific features which makes banks' CS to differ from non-financial firms. The nature of banking operations plays a key role on this matter, which also implies differences in subclassification of accounts on banks' balance sheets. Thus, a major difference about CS between banks and other non-financial companies, relies on the amount of leverage detained (as shown in Figure 4). The funding

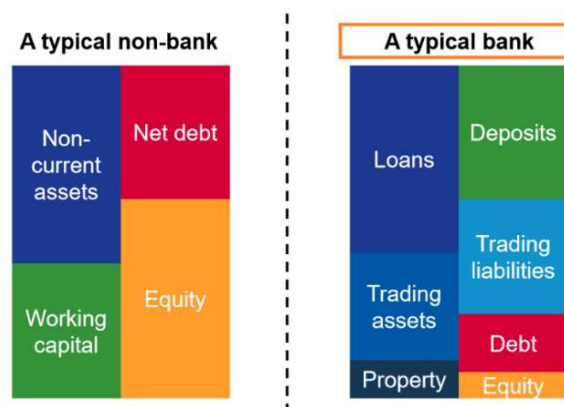


Figure 4 - Typical Balance Sheets for non-financial firms and banks (*Corporate Finance Institute, 2015*)

mix (debt and equity) of non-financial corporations is rarely regulated. Companies can rely on any amount of debt funding, while striving for a balance between tax advantage of debt over equity and risk of leveraging. Consequently, it is rare for non-financial corporations to maintain on a regular basis less than 30 per cent equity relative to their total assets. However, banking equity levels might be 5 per cent or even less relative to their assets (Admati, 2016). Likewise, banks' CS is fundamentally different from that of non-financial firms because it includes deposits, a source of financing generally absent in companies (Jouida & Hallara, 2015).

The high level of financial leverage stems from the fact that the debt in banks is subsidized by deposit insurance or other implicit redeeming guarantees opposite to nonfinancial companies (Jucá et al., 2012). Because banks operate with so low equity levels and their assets are frequently opaque, banks are flimsy. Moreover, banks often choose to make payouts (such as dividends) to their stockholders and continue to borrow instead of retaining their profits or sell additional shares to investors (Admati, 2016). Consequently, the profit maximization of banks' shareholders often involves hiring executives who are not risk averse, even though their decisions could raise concerns about banks' solvency. In turn, a lack of confidence on banking solvency can lead to a run on deposits precipitating defaults in some banks. If the failure is larger and many banks become distressed all the economy is affected and impaired. In order to maintain confidence in banks, government regulators in many countries have introduced guaranty programs (Hull, 2015). During the financial crisis of 2007-2009, the original EU's directive of 1994 – which only required a minimum level of harmonization between domestic

deposit guarantee schemes – proved to be disruptive for financial stability and the internal market. By 2009 an amending directive required EU countries to increase depositors' protection, firstly to a minimum of fifty thousand euros and by the end of 2010 to a level of one hundred thousand euros (European Commission, 2019).

However, the introduction of deposit insurance induces banks not to hold any capital given that depositors are always repaid in full up to a given amount. In any type of company, one primary function of equity, is to reduce expected bankruptcy costs by lowering the payment that must be promised to creditors. For banks specifically, whether deposits are insured, equity loses its primary role. Hence, banks have no incentives to hold capital to reduce the bankruptcy costs. At this stance, capital providers then prefer to offer their capital in the form of deposits to the banks, and receive the same return as depositors, instead of investing on equity (Allen et al., 2015). This prompts banks to raise other forms of financing than equity, rising the need for capital regulation.

By requiring banks to hold capital, a regulator reduces bankruptcy costs that would otherwise be borne by the deposit insurance fund (and ultimately market participants through some form of lump sum taxation) (Allen et al., 2015). On the contrary, in the absence of effective regulation, deposit insurance can induce banks to take excessive risks (Diamond & Dybvig in Reinhart & Rogoff, 2009) which might conduct to banking default and failure. Due to the impact of banking failures on national economies and public finances, banking has become more and more regulated along with its capital ratios. Hence, in the aftermath of the GFC (2007-2009), it was clear that banks had built up excessive leverage while apparently maintaining strong risk-based capital ratios. The underlying reason has been the proliferation of on- and off- balance sheet leverage in the banking system. In response to that, the Basel Committee on Banking Supervision (BCBS) have issued the Basel III regulation. A new leverage ratio framework in order to determine the minimum amount of regulatory capital banks are required to hold. However, the study led by Gropp & Heider (2009) previously indicated that banks carry a buffer of own capital over the minimum established by the former Basel Agreements. Under Basel III regulation, this prior conclusion still needs validation.

According to DeAngelo & Stulz (2015), regulatory limits on leverage can make sense because real-world banks do not fully internalize the costs of system-wide collapse, and so they overproduce risky liquid claims. Even though, the same authors assert that high bank leverage is not the result of moral hazard, taxes, or any other distortionary factor that could encourage banks to issue debt. The only motive for banks to issue debt comes from the value they generate by servicing the demand for socially valuable safe/liquid claims (DeAngelo & Stulz, 2015). In

this sense, if banks were forced to greater equity cushion (making the remaining debt safer), on the other hand, an impair on the supply of deposit debt or other socially valuable liquid claims could arise social costs.

As an alternative to the compulsory capital requirements Glenn Schepens (2016) proposes a more equal tax treatment of debt and equity. Based on Belgium's example of a tax shield deduction for equity, he put into evidence that a reduction in the tax discrimination between debt and equity funding could be an important part of a regulatory incentive leading to better capitalized financial institutions. He demonstrated that the change in tax treatment results in an increase in bank equity but not in a reduction of activities. Alongside to that, the referred policy would also enable regulators to target risk-taking behavior of certain banks.

Even though there is not yet an agreed optimal CS within banks, the very bottom line can be defined by pre-determined capital requirements established by financial regulators. However, relying on the empirical literature, we are able to arise some key factors that influence banking CS.

3.2. Main Factors affecting Banks' Capital Structure

In 2011, Mitchell Berlin (2011) stated that banking literature has yet to establish convincingly whether bank capital decisions are determined by market pressures – perhaps including pressures from borrowers as well as investors – or whether they are best explained as banks meeting regulatory requirements while holding an extra equity cushion. More recently, Jouida & Hallara (2015) also shared a similar perspective asserting that literature on banks has not come yet to a consensus on the determinants of capital structure. Nevertheless, recent literature regarding capital structure of firms (indistinctly financial and non-financial) has been greatly influenced by Frank and Goyal (2009) study on which factors are reliably important for CS decisions. This study has identified six major factors that empirically can be expected to have a significant impact on firm's capital structure: profitability; size; growth, nature of assets; industry conditions; and macroeconomic conditions. Meanwhile, Gropp & Heider (2009) have also documented that similarities between the CS of banks and non-financial firms could be greater than previously thought. According to their study there are five interrelated empirical facts:

- First: the sign and significance of the effect of most variables on bank CS are identical to the estimates found for non-financial firms.
- Second: Banks that would face a lower cost of raising equity at short notice (profitable, dividend paying banks with high market to book ratios) tend to hold significantly more

capital. Thus, high levels of capital on banks are not explained by buffers that banks hold insure against falls below the minimum capital required.

- Third: when it comes to leverage, banks' CS tends to hold a lot more leverage compared to non-financial firms. Over time, there is a trend for banks leverage themselves less with deposits and more with non-deposit debt.
- Fourth: like in any other sector, banks appear to have stable CS at levels that are specific to each individual bank. Additionally, in a certain period of time, is also noticeable that banks' target leverage is time invariant and bank specific. These two findings also find parallel on non-financial firms.
- Fifth: the deposit guarantee mechanism (in use across Euro area countries) – which ensures that all deposits up to one hundred thousand euros are protected – do not have a significant effect on banks' CS. This is in contrast to the assessment that banks increase their leverage in order to maximize the subsidy resultant from erroneously priced deposits.

Furthermore, in 2018, a study focusing on 16 South African banks and 26 South African insurance companies for the period 2006-2015, concluded that both banks and insurers have their own target CS. Corroborating the findings of Gropp and Heider (2009) that ordinary determinants empirically observed on non-financial firms, also apply for banks. In this sense, standard firm-level determinants of CS showed significant explanatory power for the leverage variable.

According to the reflections we addressed, combined with the main factors indicated by supporting references to this study, below is presented a synthesized explanation regarding each of them:

3.2.1. Size

Larger and more diversified firms face lower default risk (Frank & Goyal, 2009). However, for banks this rule has an opposite outcome. Large banks were in the epicenter of the GFC. Besides, systemic risk grows with bank size and is inversely related to bank capital. Nevertheless, size of large banks has increased substantially over the last two decades (Laeven et al., 2016)

Tin and Diaz (2017) on a study focusing the bank leverage of thirty-one Vietnamese commercial banks from 2009 to 2014, have found that bank size is the most consistent variable affecting leverage in the three groups of studied banks (large, medium and small).

Laeven et al., (2016), in a solid sample of 412 deposit-taking institutions from 56 countries for the period from middle of 2007 to the end of 2008, found strong evidence that systemic risk increases with bank size. The study also revealed some evidence that systemic risk is lower in more-capitalized banks, with the effects particularly more pronounced for large banks. Their conclusion was that large banks pose excessive systemic risk, but on the other hand, larger banks may also offer efficiency gains. As such, the balance between these two considerations is a complex trade off and requires more research to guide banking policy in this crucial area.

3.2.2. Profitability

According to Frank and Goyal (2009), more profitable companies face lower financial distress. In this sense, Gropp and Heider (2010) pointed out that profitability is a prior-factor of importance on banks' CS, which means that independently from market and timing conditions, profitability is a core variable for bank's capital structure explanation. Similarly, the same found is supported by Jouida and Hallara (2015) and Sorokina, et al. (2017) who also found profitability to be one of the factors affecting banks leverage.

3.2.3. Growth

Growth and leverage have been considered positively related by several authors indistinctly for non-financial and financial firms (Frank and Goyal (2009), Gropp and Heider (2010), Jouida and Hallara (2015), Sorokina, et al. (2017) and Sibindi & Makina, (2018)). Additionally, within the framework of management, leverage often rises as natural enabler in the absence of enough owned resources, or when tax shields are rewarding in terms of financial decisions.

However, in a broader spectrum which is the case, we have to take in consideration the economic cycle. Thus, during recessions equity value tends to decline, but on the contrary, during expansions there is no evidence that growth has an explanatory meaning on banking CS decisions. Notwithstanding, is considered as a first-order importance variable for the banks' CS.

3.2.4. Collateral

Collateral is assessed as a given security for a loan. According to Jouida and Hallara (2015) collateral is positively related to debt. Holding a high portion of tangible assets, this may serve as collateral in the insurance debt. Using collateral, the moral-hazard concerning debt can

be reduced which lowers the costs of debt enabling firms to be more levered. By this way, collateral is considered an important factor for banks' CS.

3.2.5. Dividends

Frank and Goyal (2009) and Gropp and Heider (2010) conclude that companies and banks which pay dividends are more profitable and, therefore, less leveraged. However, during periods of financial hardship, paying dividends is not recommendable for firms with high leverage and/or low profitability. Dividends were also considered as a factor of main importance for banks' CS by Gropp and Heider (2010), Jouda and Hallara (2015) and Sorokina, et al., (2017).

Even though, by the view too-big-to-fail, regulators are reluctant to close or unwind large and complex banks resulting in a moral hazard behavior that leads banks to take on excessive risks in the expectation of governments bailouts (Laeven, et al., 2016). This fact, combined with the resounding issue that shareholders frequently decide to continue borrowing instead of reinforce equity, confirms that further empirical investigation is needed.

Beyond that, due to the tremendous effect that GFC had over national economies, this variable is a first-order importance variable, having also been identified as such by Gropp and Heider (2010).

3.2.6. Risk

Frank and Goyal (2009), stated that Firms with more volatile cash flows face higher expected costs of financial distress and should use less debt.

DeAngelo and Stulz (2015) declared that risk management is a major co-star of the show, as it provides the critical asset-side foundation that enables banks to produce large amounts of safe/liquid claims. The problem arises when riskier banks, close to the minimum regulatory capital do not adjust to their CS towards more equity, potentially endangering all banking system.

From what is above mentioned results that banking sector greatly depends on adequacy of liquidity flows and a solid risk assessment on the asset-side, making risk as well a first-order importance factor explaining banks' CS.

3.2.7. Regulatory Capital Requirements

Most of the literature on finance do not consider regulatory capital requirements as a main factor influencing the choice of capital structure by banks. However, most of the studies

conducted until now, were undertaken before or during a transition period when Basel III was being implemented. As suggested by Sibindi and Makina (2018), our intention by adding a supplementary variable, is to examine the impact of the implementation by ECB of these new capital standards on the financing patterns of banks and assess how these new binding rules have impacted on CS decisions of the Portuguese banking.

4. Methodology

4.1. Aim and objectives

The study aims to examine whether the standard determinants of corporate CS defined by the empirical literature also apply to Portuguese banks in the last ten years' period (2008-2017). In this scope, were defined the following specific objectives: (i) analyze to what extent the financial leverage of the Portuguese banks is correlated with firm-level capital determinants; (ii) assess whether regulatory capital exerts influence over the CS of Portuguese banks; (iii) evaluate whether CS of the Portuguese banking, in the period from 2008 to 2012 (GFC and eurozone crisis), shows significant differences compared to the subsequent period 2013-2017.

Therefore, it will be possible to validate whether the capital determinants drivers, raised by empirical literature, have the same correlation within Portuguese banking.

4.2. Investigation paradigm

The study has followed a positivist research approach, which assumes the existence of an independent and autonomous reality, either independent from the searcher perspective and its personal beliefs. Positivism is commonly described as an epistemology that seeks explanations of events in order to disclose their underlying laws. Therefore, is frequently associated to exact sciences, whereas relies on mathematical and statistical methods to find unbiased results.

In this sense, this approach enables the author to validate the investigation hypotheses and the empirical knowledge regarding the investigation problem through statistical and mathematical methods. In this sense the research is empirically observable inducting reasonings used to raise hypotheses which are tested within the study confirming or denying the theory.

This investigation is in line in comparison to similar studies concerning banking and firms' CS, used by others investigators in order to study the topic.

4.3. Data Sources and Sample Description

The population for this study was selected based on the banks indicated in the 2017 Statistical Bulletin of the Portuguese Bank Association (APB), considering as main premise:

institutions that have been functioning continually in Portugal over the last ten years (2008-2017).

Besides, for the above mentioned sampling frame, banks fitting in one of the following categories have also been exempted: (1) banks with a blended composition (such as the group of Caixas de Crédito Agrícola); and, (2) banks that have been shut down due to bankruptcy or assimilated by other financial institutions. Therefore, the set of banks selected to conduct our research, is displayed on the Appendix to this document consisting of 18 banks.

The required financial information concerning the banks was obtained from the corporate governance and annual financial reports, publicly available on the website of the Banco de Portugal as well as at the official websites of each bank for the fiscal years comprehending the period from 2008 to 2017. Accordingly, it was expected 180 observations, although only 166 observations were confirmed to all variables due to lack of data on some banks.

The analysis was conducted using IBM SPSS (Statistical Package for Social Sciences) program version 25 and STATA version 16.

4.4. Variables

In our research, we use underlying factors that were found significant by Frank and Goyal (2009), Gropp and Heider (2010) and Sorokina et al. (2017).

Data concerning the analyzed banks was directly obtained from disclosed annual statements or calculated on its basis. Therefore, the following table presents both dependent and independent variables utilized in this study.

Table 1 – Variables’ description and framework (Own production).

Variable typology	Variables	Measure	Description
Dependent	LEV	Book Leverage	$1 - \frac{\text{Book value of equity}}{\text{Book value of assets}}$
Independent	RCAP	Leverage Ratio (Tier 1 Capital only)	$\frac{\text{Tier 1 Capital}}{\text{Book Value of Assets}}$
	SIZE	Ln of total assets	Ln (total book value of Assets)
	PROF	Return on Assets (ROA)	$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$
	GROW	Annual variance of Total Assets	Annual variance of Total Assets
	COL	Proportion of tangible assets which may be used as collateral compared to the book value of total assets	$\frac{(\text{Total securities} + \text{Cash and due from banks} + \text{Fixed assets})}{\text{Book value of Assets}}$
	DIV	Whenever dividends are paid (dummy variable)	Dividends paid = 1; If not = 0
	RISK	Percentage of accumulated impairment of loans and advances to customers on gross loans and advances to customers	$\frac{\text{Impairment of Accumulated Loans and Advances to Customers}}{\text{Gross Loans and Advances to Customers}}$
CRIS	GFC & eurozone debt crisis effect (dummy variable)	2008-2012 period = 1 Otherwise = 0	

Notes: LEV = Book Leverage; RCAP = Regulatory Capital; PROF = Profitability; GROW = Growth; COL= Collateral; DIV = Dividends; CRIS = Crisis

Regarding both dependent and independent variables, we took into consideration metrics previously used in the reference literature, trying to adapt them to our study as much as possible.

To measure Banks’ CS, the dependent variable selected was book leverage, in harmony with the leverage definition adopted by Gropp and Heider (2010). In this scope, the main goal is to measure how much capital comes in the form of debt, and by that, perceive how the bulk of assets is being funded.

In relation to independent variables, the regressors selected mainly correspond to bank-level determinants of CS found in the empirical literature, including two dummy variables, DIV and CRIS. However, the last one, jointly with RCAP, have been an innovation of our research, aiming to capture the economic cycle effects of the crises (GFC and eurozone crisis), as well

as to assess the effects of the mandatory capitalization of the Portuguese banks determined by the regulators.

A natural logarithm was used for the variable Size. Taking the value of total assets for each bank, this method enables the adjustment of the values into a comparable size scale, making banks comparable in terms of dimension.

In relation to the variable growth, the selected proxy has been annual variance of total assets, considering that a change on assets total value presents inflows or outflows of capital, and thus, impacting on CS. This metric was also utilized by Sibindi (2018) in order to measure the dependent variable growth.

Concerning risk, our initial intention was to use the Non-Performing Loans (NPL) ratio as proxy. However, due to the lack of disclosed information for every bank, our option was an alternative indicator based on impairment of loans to gross loans.

The dependent variable collateral was obtained by summing up several balance sheet items then divided those items by the book value of total assets. This metric is consistent with the equivalent collateral variable found on former studies, to include on Gropp & Heider (2010) research.

The dummy variables employed in this study intended to detect the effects of the GFC and the eurozone crisis (2008–2012), as well as a dummy variable to capture one of the remaining firm-level determinants of capital structure: payment of dividends.

4.5. Regression model

In order to identify which capital determinants contribute the most to explain the CS of Portuguese banks, a multiple linear regression model was put in place. When applying multiple regression, we construct a model to explain variability in the dependent variable, which concomitantly enables to determine the simultaneous effect of several independent variables on the dependent variable (Newbold et al., 2013). Thus, the data is analyzed by conducting a regression analysis for panel data, in order to determine to what extent standard firm-level determinants of CS apply to the Portuguese banking.

The simplest model to analyze our data set, was the pooled ordinary least squares (OLS) model. However, OLS can only be utilized when some required conditions are previously ensured – for instance: the error terms have the same variance (which is referred to homoscedasticity); there is no correlation between the errors; and there is no correlation between errors terms and explanatory variables. As the banks are repeatedly observed, it can be predicted that the error terms from different time periods might be correlated.

Because of these limitations, more developed models have been employed in this research. Other than the pooled OLS, there are two alternative techniques used to analyze panel data: Fixed Effects (FE) and Random Effects (RE). To decide which model (OLS, fixed or random effects) adjusts better, several tests can be conducted. In this scope, we have applied in two stages Breusch-Pagan and Hausman tests, in order to decide which model could better adjust to our study.

Firstly, we have employed Breusch-Pagan test which tests the heteroscedasticity of errors in a regression. For a regression model be considered valid, homoscedasticity must be ensured. The null hypothesis for this test is that the error variances are equal, while the alternate hypothesis is that the error variances are not equal (more specifically, as Y increases, the variances increase or decrease). After applying the test, we concluded that the null hypothesis was rejected leading us to proceed to the Hausman test.

Hausman test basically detects endogeneity issues among regressors, which refers to situations when an explanatory variable is correlated with the error term. Thus, the null hypothesis is that the preferred model is RE model, against the alternate hypothesis of use FE model. Using the FE model, it is assumed that all the explanatory variables $X_{i,t}$ are independent of the error terms $u_{i,t}$ and there is no correlation between the variables and the errors terms. If the errors are correlated, then FE is no suitable since inferences may not be correct. Unlike the FE model, on the RE model the variation across entities is assumed to be random and uncorrelated with the independent variables.

In a second stage we have applied Hausman test, resulting in rejecting the null hypothesis, which meant to choose the FE model as the adequate for our panel data.

Therefore, Model 1 aims to explain aims to explain to what extent standard firm-level determinants of CS apply to the Portuguese banking:

- Model 1:

$$\hat{Y}_{i,t} = \alpha_i + RCAP_{i,t}\beta + SIZE_{i,t}\beta + PROF_{i,t}\beta + GROW_{i,t}\beta + COL_{i,t}\beta + DIV_{i,t}\beta + RISK_{i,t}\beta + CRIS_{i,t}\beta + \varepsilon_{i,t}$$

$$(i = bank = 1, \dots, 18; t = 1, \dots, 10)$$

$$\hat{Y} = LEV$$

The variables were all introduced simultaneously through stepwise method in order to determine which are statistically significant to predict banking leverage.

4.6. Investigation hypotheses

In line with the raised regression model, the following hypothesis and sub-hypothesis were tested through econometric analysis:

- H_0 : *Independent variables have no explanatory power on Portuguese banks' book leverage*
($\beta_i=0$)
- H_1 : *Independent variables have explanatory power on Portuguese banks' book leverage*
($\beta_i\neq 0$)
 - H_{1a} : *RCAP has a negative and significant impact on Portuguese banks' book leverage*
 - H_{1b} : *SIZE has a positive and significant impact on Portuguese banks' book leverage*
 - H_{1c} : *PROF has a negative and significant impact on Portuguese banks' book leverage*
 - H_{1d} : *GROW has a positive and significant impact on Portuguese banks' book leverage*
 - H_{1e} : *COL has a positive and significant impact on Portuguese banks' book leverage*
 - H_{1f} : *DIV has a significant impact on Portuguese banks' book leverage*
 - H_{1g} : *RISK has a negative and significant impact on Portuguese banks' book leverage*
 - H_{1h} : *CRIS has a significant impact on Portuguese banks' book leverage*

5. Results and discussion

5.1. Descriptive measures

Descriptive Statistics are displayed on table 2 below. As already mentioned, our sample consists of 18 banks for a ten-years period analysis (2008-2017). Thus, 180 observations were expected. However, only 166 have been effectively verified for every indicator, due to the lack of certain financial data disclosed by the banks in their financial statements.

Table 2 – Descriptive measures

Variable typology	Variable	N	Minimum	Maximum	Mean	Standard Deviation
Dependent	LEV	180	0,5530	0,9990	0,903801	0,0530007
Independent	RCAP	166	0,0131	0,3187	0,087065	0,0635867
	SIZE	180	10,6287	18,5412	15,022654	1,9154371
	PROF	180	-0,0389	0,2692	0,077384	0,0238513
	GROW	178	-0,6558	2,9577	0,077348	0,3237246
	COL	180	0,0072	0,9725	0,469739	0,2868613
	RISK	180	0,0000	0,3725	0,054798	0,0561333

Analyzing the obtained results, some considerations can be drawn. On the dependent variable (Book Leverage) the mean registered a percentage of 90,4% and a standard deviation of 5,3% evidencing in most Portuguese banks a low degree of financial autonomy, although in line with previous findings by related empirical literature.

Regarding the independent variables, it should be highlighted the following aspects: (1) 41% of the banks have payed dividends during the years considered; (2) Profitability (whose selected proxy has been ROA), reveals a mean of 0,078, lower when compared to the similar empirical studies regarding European banks (Sha'ban, 2016; Jouida & Hallara, 2015).

In relation to the dividends policy followed by the banks, we found no differences between the crisis period (2008-2012) and the post-crisis phase (2013-2017). Conversely to the expectations, the observations evidence a similar conduct in what refers to dividends' payment: 54 banks have not paid dividends during 2008-2012, which do not differ much from the 53 banks who have not also paid dividends in the subsequent period (see table 3 below).

Table 3 – Dividends Paid

Dividends Paid	NO	YES	Total
Crisis Period (2008-2012)	54	36	90
Post-Crisis Period (2013-2017)	53	37	90
Total	107	73	180

We understand this outcome as a probable consequence of the policies taken by the regulator after the crisis (2008-2012) – in order to increase capital ratios in accordance to the new Basel III capital requirements – which forced banks to strengthen their capital ratios rather

than paying dividends to their shareholders. Below, Figure 5 displays a graphic insight over the referred dividends' policy followed by the Portuguese banking in each period.

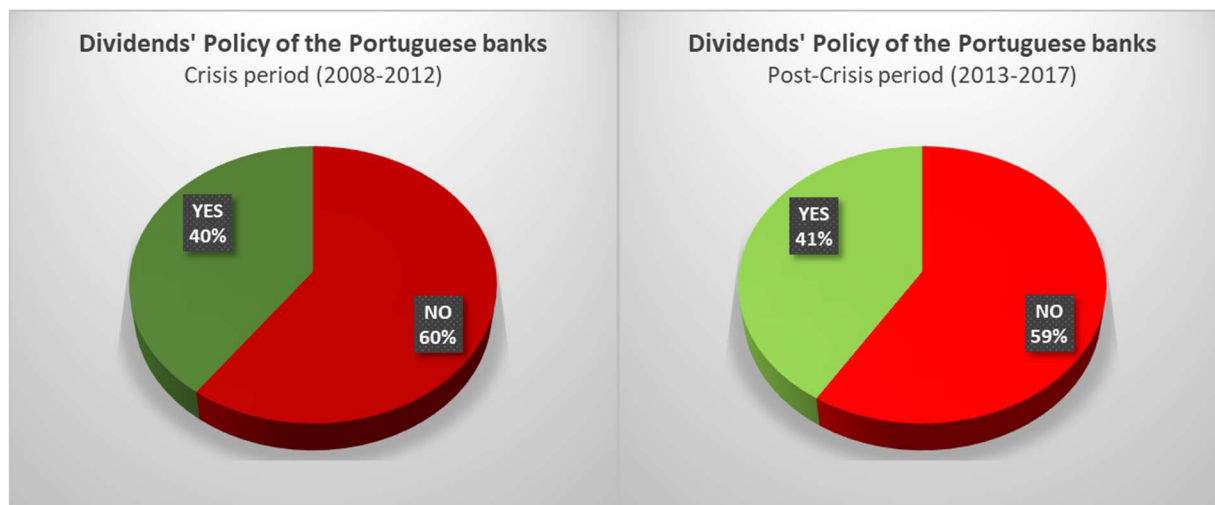


Figure 5 – Dividends' policy of the Portuguese Banks (Own production).

5.2. Correlation analysis

Bivariate correlation analysis was steered through Pearson correlation coefficients in order to evaluate whether there is any relationship between the variables and its respective strength.

Correlation analysis expresses the linkage between two variables and values will always be between +1 and -1. The sign indicates the direction, whether the correlation is positive or negative, and the value, called correlation coefficient, measures the strength of the correlation. A correlation coefficient of zero indicates no relationship between the variables at all.

Additionally, the significance level is the probability of rejecting the null hypothesis when it is true. In general, results with a significance level of 0.05 (5% error probability) are considered statistically relevant. In this way, it is said that the result is statistically significant when the observed p-value is less than the parameter defined for the study.

The following matrix evinces the relationship between the variables presented in this study when combined two by two.

Table 4 – Pearson correlation coefficients

VAR.	LEV	RCAP	SIZE	PROF	GROW	COL	DIV	RISK	CRIS
LEV	1								
RCAP	-0,940** 0,000	1							
SIZE	0,591** 0,000	-0,475** 0,000	1						
PROF	-0,286** 0,000	0,417** 0,000	-0,239** 0,001	1					
GROW	0,036 0,633	0,008 0,918	0,085 0,258	0,016 0,828	1				
COL	-0,359** 0,000	0,405** 0,000	-0,434** 0,000	0,127 0,089	-0,019 0,801	1			
DIV	-0,202** 0,007	0,214** 0,006	0,020 0,787	-0,183* 0,014	-0,086 0,256	-0,109 0,144	1		
RISK	-0,096 0,201	0,074 0,343	0,024 0,754	0,088 0,241	-0,034 0,650	-0,125 0,094	-0,110 0,143	1	
CRIS	0,151* 0,043	-0,176* 0,023	-0,036 0,631	-0,155* 0,038	0,091 0,229	0,017 0,818	0,011 0,880	-0,215** 0,004	1

Notes: **p < 0,01; *p < 0,05.

As observed on the table above, we would like to highlight the following statically significant relationships between the dependent variable LEV and the independent variables:

- RCAP is negatively and significantly associated with LEV ($r = -0,940$; $p = 0,000$);
- SIZE is positively and significantly associated with LEV ($r = 0,591$; $p = 0,000$);
- PROF is negatively and significantly associated with LEV ($r = -0,286$; $p = 0,000$);
- COL is negatively and significantly associated with LEV ($r = -0,359$; $p = 0,000$);
- DIV is significantly associated with LEV ($r = -0,202$; $p = 0,007$);
- CRIS is significantly associated with LEV ($r = 0,151$; $p = 0,043$).

Thus, in relation to the influence of CS determinants, the null hypothesis can be rejected at a 1% level of significance for the variables RCAP, SIZE, PROF, COL and DIV. Beyond that, the null hypothesis can also be rejected at a 5% level of significance for the variable CRIS, which means that the alternative sub-hypothesis H_{1a} , H_{1b} , H_{1c} , H_{1e} , H_{1f} and H_{1h} can be accepted.

The correlations found are in line with the predictions of the major CS theories. Relatively to the variable size, results corroborate the findings achieved by Gropp & Heider, 2010 and Sibindi, 2018, which also stated that leverage is positively correlated with size. This evidence also aligns with the trade-off theory of CS, since larger banks tend to be highly levered compared to small banks, (inasmuch as the last ones face higher debt interest rates). Conversely, Sha'ban, et al., 2016, found that size is negatively correlated with leverage.

Leverage is inversely correlated with profitability, and the correlation is highly significant. According to Sibindi, 2018, this can be explained premised on the predictions of the pecking order theory. The more profitable a bank is, the more likely that will generate reserves

than rely on debt to fund its assets. The same evidence is also corroborated by Gropp & Heider, 2010.

Concerning collateral, our result (collateral is negatively correlated with leverage) also aligns with the evidence found by Gropp & Heider, 2010 and Sha'ban et al., 2016, which states that leverage is negatively correlated with collateral.

The correlation coefficient for the variable dividends, consolidates the literature confirming that leverage is significantly correlated with dividends (Gropp & Heider, 2010 and Sha'ban et al., 2016).

5.3. Multiple linear regression model

A Multiple Linear Regression (MLR) examines how several explanatory (independent) variables are related to one dependent variable. Thereby, a MLR was employed in order to realize if there is a statistically significant relationship between the independent variables and the dependent variable, allowing to gauge about the effects of the CS determinants on Portuguese banks' leverage over the period 2008-2017.

The regression equation for Model 1 is evidenced in the table below.

Table 5 – Regression model equation (Model 1)

	β (Std)	t	P> t	VIF
RCAP	-0,7831429	-2,37	0,023*	1,751
SIZE	0,0193168	0,99	0,331	1,580
PROF	-0,0719689	-0,89	0,379	1,593
GROW	-0,0005681	-0,24	0,814	1,103
COL	0,0163013	0,47	0,644	1,432
DIV	0,0013421	0,16	0,873	1,316
RISK	0,0129705	0,08	0,934	1,111
CRIS	0,021824	2,95	0,006**	1,122
CONSTANT	0,6431474	2,13	0,040*	

Adjusted R-sq = 0,3656
Prob > F = 0,0000

Notes: **p < 0,01; *p < 0,05.

As can be observed above, the coefficient of determination (also expressed as R-sq or R²) is 0,3656 in this model. First of all, is important to mention that the coefficient of determination, is a widely used indicator since it expresses the explanatory power of a regression model. The R² varies between zero and one, indicating in what proportion the independent variables actually affect the dependent variable. Hereupon, the closer R² is to 1, the more explanatory is

the model, and thus the better it fits the sample. However, the inclusion of numerous variables, even if they have very little explanatory power over the dependent variable, will increase the value of R^2 . This encourages the indiscriminate inclusion of variables, undermining the principle of parsimony. Thus, as an alternative measure to R^2 , exists the adjusted determination coefficient (also known as Adjusted R^2), which penalizes the inclusion of little explanatory regressors.

In this sense, considering the Adjusted R^2 value obtained, it can be concluded that the variance of the dependent variable is explained in 36,56% by the independent variables conjointly considered. By other words, this means that Model 1 explains in 36,56% of the variance of Portuguese banks' leverage over the period 2008-2017.

As initially expected, the results obtained allow to conclude that two of the explanatory variables are statistically significant, whereas: RCAP (standardized $\beta=-0,7831429$; $p=0,023$), present a negative impact on dependent variable LEV; while predictor CRIS (standardized $\beta=0,021824$; $p=0,006$) offer a positive effect over LEV.

Relatively to RCAP, the finding is in line with the evidence found by Gropp & Heider (2010), that capital requirements do introduce a non-linearity in the behavior of banks when capital falls to levels very close to the regulatory minimum.

Besides, in regard to the second regressor (CRIS), a strong connection between bank funding and financial crises (GFC and eurozone crisis) can also be found in literature. Pertaining this view, Adrian van Rixtel and Gabriele Gasperini (2013), have clearly exposed this relation: *“ultimately, these strains (on the asset side of banks' balance sheets) expose growing problems in the quality of the underlying assets, leading to fire sales of assets which accelerate declines in asset prices, resulting in further balance sheet pressures. Throughout this process, funding liquidity crises can exacerbate solvency concerns. These tensions feed on imbalances in bank funding structures, such as excessive recourse to debt financing that is reflected in historically high degrees of leverage”*. Similarly, Sha'ban et al., 2016, also found through regression analysis that GFC and euro sovereign debt crisis had a significant negative effect on equity capital held by european banks.

All the other independent variables are not statistically significant to explain the model, which only leads to the rejection of the raised sub-hypothesis, excepting H_{1a} and H_{1h} which reject the null hypothesis.

5.3.1. Reliability of the regression model

Using STATA version 16, the reliability of the regression was ensured by analyzing which model would best adapt to the panel data found for the study. Breusch-Pagan and Hausman tests were also conducted, concluding that the appropriate model for our regression was the FE model. In this context, heteroscedasticity and endogeneity presence in the model has been controlled, ensuring the robustness and reliability of results obtained.

Besides, the Variance Inflation Factor (VIF) detects multicollinearity in regression analysis. Multicollinearity occurs when there is a high correlation between regressors (independent variables) and its presence can adversely affect regression model results. The VIF estimates how much the variance of a regression coefficient is inflated due to multicollinearity, ranging from one upwards (a VIF value above 10 indicates high correlation and is cause for concern). Regarding our model, we find that none of the independent variables has a VIF value greater than 1,7 allowing to conclude that the analysis does not observe a severe problem of multicollinearity.

5.4. Independent Samples T-Test

The independent samples t-test compares two independent groups of observations or measurements on a single characteristic (Lani, 2019). The following table assesses differences among variables between two distinct periods: crisis period (2008-2012) and post-crisis period (2013-2017).

Table 6 – Variables comparison between periods (2008-2012 Vs. 2013-2017)

Variable	Equality of Variances (F)	Sig.	Equality of Means (t)	df	Sig.	Hypothesis Test (U)
LEV	1,872	0,173	-2,039	178	0,043**	Rejected
RCAP	9,970	0,002***	2,295	164	0,023**	Rejected
SIZE	2,071	0,152	0,481	178	0,631	Not Rejected
PROF	5,602	0,019**	2,093	178	0,038**	Rejected
GROW	2,982	0,086*	-2,271	176	0,024**	Rejected
COL	5,057	0,026**	-2,231	178	0,818	Not Rejected
DIV	0,091	0,763	-0,151	178	0,880	Not Rejected
RISK	0,427	0,514	2,942	178	0,004***	Rejected

Notes: ***p < 0,01; **p < 0,05; *p < 0,1.

The results suggest that there are statistically significant differences between the two periods, whereby the null hypothesis (no difference between the two periods) can be rejected for the variables LEV, RCAP, PROF, GROW and RISK.

Therefore, as expected, the bottom line that can be taken, is that GFC and eurozone crisis have had a significant impact over Portuguese banking affecting not only its solvability, but also their profitability, growth and risk.

From an economic point of view this stance is also corroborated. Since 2007, and more clearly since 2010, Portuguese banks have experienced a sharp decline on profitability in result of a significant increase on impairments value (a condition which have just reversed in recent years), which has combined with a deterioration on the net interest income of the Portuguese banks.

Simultaneously, the decline in asset prices (in part due to the increase of impairments as well), along with the escalation of non-performing loans ratio, have conducted to a rise on risk indicators during the peak of the eurozone crisis (2010-2012) – which still poses some persistence across certain institutions of the banking system.

Nevertheless, concerning leverage, a significant increase in solvency levels has been noticed after the crisis period (2008-2012). Presumably as consequence of the higher regulatory requirements.

6. Conclusions

This paper examines the Capital Structure (CS) of the Portuguese banks building on empirical CS literature for banking industry. Our research contributes to the literature by extending the study on main CS determinants to the Portuguese banking, deepening the knowledge about the funding of the Portuguese banks in the last years.

We use a sample of 18 Portuguese banks covering the period of GFC and eurozone crisis (2008-2017). The gathered sample includes commercial banks, investment banking and consumer credit banking. The specific objectives consist on: (i) analyze to what extent the financial leverage of the Portuguese banks is correlated with firm-level capital determinants; (ii) assess whether regulatory capital exerts influence over the CS of Portuguese banks; (iii) evaluate whether CS of the Portuguese banking, in the period from 2008 to 2012 (GFC and eurozone crisis), shows significant differences compared to the subsequent period 2013-2017.

The analysis conducted employs descriptive and association measures, a multiple linear regression model and an independent sample t-test. The study examines seven bank-specific factors (i.e.: regulatory capital, size, profitability, collateral, growth, dividends payment) and

one economic variable (crisis prevalence) influencing CS with book leverage as the dependent variable. Regressing the panel data through the FE model, we find that the factors that significantly impact Portuguese banking CS are: regulatory capital and crisis.

With regard to correlation analysis, our findings are in line with the predictions of the major CS theories. Relatively to the variable size, results corroborate the findings achieved by Gropp & Heider, 2010 and Sibindi, 2018, which also stated that leverage is positively correlated with size. Besides, leverage is inversely correlated with profitability, which can be explained premised on the predictions of the pecking order theory. The more profitable a bank is, the more likely that will generate reserves than rely on debt to fund its assets. Concerning the variable collateral, our result aligns with the evidence found by Gropp & Heider, 2010 and Sha'ban et al. (2016), which states that leverage is negatively correlated with collateral. For the variable dividends, the correlation coefficient, consolidates the literature confirming that leverage is significantly correlated with dividends (Gropp & Heider, 2010 and Sha'ban, et al., 2016).

This research also assesses on the impact of the crisis over the variables by splitting the period in two stages (2008-2012: crisis period vs. 2013-2017: post-crisis period). Results suggest that the distribution of leverage is different among periods for the predictors RCAP, PROF, GROW and RISK.

The results of this study, confirm that Portuguese banks' CS is not exclusively, neither merely, determined by capital regulations, giving support to the view which extends conventional determinants of CS for non-financial firms to banks – Gropp & Heider (2010); Sha'ban et al., (2016); Sorokina, et al., (2017); Sibindi & Makina (2018). However, it was quite clear that during the period under review, regulatory capital as well as the economic effects of the financial crisis strongly impacted on the leverage ratios of Portuguese banks. In a first phase by reducing the proportion of capital, followed by a second phase of strengthening the capital adequacy ratios.

Hence, and given the economic risks looming over the horizon, it is essential that Portuguese banking stakeholders “in their assessment of bank security and soundness”, take in consideration the appraisal made by Sorokina et al., 2017: “that a bank may be undercapitalized even when it holds capital above regulatory requirements”.

6.1. Limitations

Due to unrevealed data by some banks, the independent variable regulatory capital shows few missing values. Nevertheless, we were able to partially demonstrate that Portuguese

banking corroborates the empirical principle that regulatory requirements eventually influence banks' CS, whenever it approaches the required minimum forcing regulators to intervene. The past events since 2008, which led regulators to impose capital reinforcements on Portuguese banks, take us to believe that this observation has also a significant statistical translation.

On the other hand, the difficulties selecting the metrics' as proxies for the study's predictors, might implies some bias of a better match with the previous empirical results about this subject.

Other than that, the fact that all data was manually collected (although confirmed and revised multiple times), poses the risk that human mistake is not completely excluded from this analysis.

6.2. Further research

Our study opens additional paths for future research. Thereby, there are still different approaches to be explored within Portuguese banking CS. Therefore, it would be interesting to investigate what is the relationship between size and bank leverage, or investigate how equity held by banks can be influenced by performance or risk taking. Moreover, it would be also interesting to study how sovereign debt ratings had specifically affected bank solvency.

Additionally, new proxies for CS determinants and an analysis extended over a longer period would also contribute to enrich the knowledge about Portuguese banking CS.

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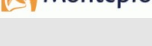

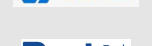







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Appendix

The 18 selected banks from the 2017 Portuguese Banks Association Statistical Bulletin, which constitute the sample of this research in accordance with the established criteria, are the ones listed below:

Table 7 – Banks focused on this study (Own production. Data source: (Associação Portuguesa de Bancos, 2018))

Logo	Bank Trademark	Official Firm Denomination
	EuroBIC	Banco BIC Português, S.A.
	Banco Carregosa	Banco L. J. Carregosa, S.A.
	Millennium BCP	Banco Comercial Português, SA
	ActivoBank	Banco ActivoBank, S.A.
	Banco de Investimento Imobiliário	Banco de Investimento Imobiliário, S.A.
	Banco BIG	Banco de Investimento Global, S.A.
	Banco Finantia	Banco Finantia, S.A.
	Banco Invest	Banco Invest, S.A.
	Banco Montepio	Caixa Económica Montepio Geral
	Caixa Geral de Depósitos	Caixa Geral de Depósitos, S.A.
	CaixaBI	Caixa – Banco de Investimento, S.A.
	Banco Best	BEST – Banco Eletrónico de Serviço Total, S.A.
	BBVA	Banco Bilbao Vizcaya Argentaria (Portugal), S.A.
	BPI	Banco Português de Investimento, S.A.
	Credibom	Banco Credibom, S.A.
	Santander Consumer Portugal	Banco Santander Consumer Portugal, S.A.
	Santander Totta	Banco Santander Totta, S.A.
	BNP Paribas	BNP Paribas – Sucursal em Portugal