



The Determinants of Bank Profitability: Evidence from Portugal

Pedro Nunes

Dissertation written under the supervision of Eva Schliephake

Dissertation submitted in partial fulfilment of requirements for the MSc
in Finance, at the Universidade Católica Portuguesa, January 2021.

Abstract

The present dissertation aims to study key factors that determine the profitability of Portuguese Banks. We use public data from Associação Portuguesa de Bancos (APB) between the first semester of 2010 to the last semester of 2019. Moreover, we split the sample into banks under intervention (acquisition, merger and/or bankruptcy) and sound banks to analyze the behavior of different variables when we regress in each model. Following Arellano and Bover (1995) and Blundell and Bond (1998), we employ a dynamic model specification, known as the Generalized Method of Moments, which controls for profit persistence. As the main measure of bank profitability, we use return on average assets (ROAA). This research's findings suggest that good efficiency, higher revenue diversification, higher capitalization, and a larger proportion of deposits positively impact Portuguese banks' profitability. Loan loss provisions only have a significant negative impact on profitability measure ROAA when we regress with banks under intervention. Also, during this period, we provide evidence of a negative relationship between size and profitability when we regress with return on average equity (ROAE). Finally, our study does not show any clear relationship between macroeconomic factors and the Portuguese banks' profitability.

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Author: Pedro Rúben Gonçalves Nunes

Keywords: Bank profitability, bank-specific factors, macroeconomic factors

Resumo

A presente dissertação tem como objetivo estudar os principais fatores que determinam a rentabilidade dos Bancos Portugueses. Deste modo, utilizámos dados públicos provenientes da Associação Portuguesa de Bancos (APB) para o período compreendido entre o primeiro semestre de 2010 e o último semestre de 2019. Além disso, dividimos a amostra em bancos sob intervenção (aquisição, fusão e/ou falência) e bancos sólidos para analisar o comportamento de diferentes variáveis quando fazemos regressões em cada modelo. Seguindo Arellano e Bover (1995) e Blundell e Bond (1998), usamos uma especificação de modelo dinâmico conhecido como Método Generalizado dos Momentos, que controla a persistência do lucro. Como principal medida de desempenho dos bancos, utilizamos o retorno sobre os ativos médios (ROAA). Os resultados deste estudo sugerem que boa eficiência, maior diversificação das receitas, maior capitalização e maior proporção de depósitos têm um impacto positivo na rentabilidade dos bancos portugueses. As provisões para perdas com empréstimos só têm um impacto negativo significativo na medida de desempenho ROAA quando regredimos com bancos sob intervenção. Além disso, durante este período, fornecemos evidências de uma relação negativa entre o tamanho e o desempenho quando usamos regressões com o retorno sobre o património líquido médio. Finalmente, o nosso estudo não mostra nenhuma relação clara entre os fatores macroeconómicos e a rentabilidade dos bancos portugueses.

Título: Os Determinantes da Rentabilidade Bancária: Evidência de Portugal

Autor: Pedro Rúben Gonçalves Nunes

Palavras-chave: Rentabilidade bancária, fatores específicos do banco, fatores macroeconómicos

Acknowledgement

I would like to thank my dissertation supervisor Eva Schliephake for the guidance and suggestions that were very helpful for the thesis completion.

As this journey comes to an end, I want to thank all the professors that inspired me throughout the years and prepared me for the next adventure. Also, for my colleagues and friends, I thank them for providing a pleasure and a friendly working environment.

To my closer friends, a special thank you for the unconditional friendship, patience, and for all the moments we shared throughout these years.

Last but not least, I am very grateful for the caring family that I have and for all the support that they provide me every day. To my parents, brother and sister, thank you for always being there when I most need you and for all the strength that you give me.

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List of Abbreviations

APB- Associação Portuguesa de Bancos

BANIF- Banco Internacional do Funchal

BES- Banco Espírito Santo

BPN- Banco Português de Negócios

BPP- Banco Privado Português

CGD- Caixa Geral de Depósitos

CIR- Cost-income ratio

EC- European Commission

ECB- European Central Bank

EEC- European Economic Community

EFAP- Economic and Financial Assistance Program

GDP- Gross Domestic Product

GMM- General Method of Moments

IMF- International Monetary Fund

LLP- Loan Loss Provisions

OECD- Organization for Economic Cooperation and Development

ROAE- Return on Average Equity

ROAA- Return on Average Assets

US- United States

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1. Introduction

Financial institutions constitute the life-blood of an economy, and there is evidence that sound banking is crucial for sustainable economic growth (Arestis and Demetriades, 1997). Besides, banks provide financial intermediation between lenders and savers, which helps them transfer the necessary funds efficiently. In this regard, banks are responsible for providing funds, and their stability is paramount for the financial system. In the speech by the Vice President of the European Central Bank (ECB) Luis de Guindos in 2019, he mentions that bank profitability matters for financial stability. Furthermore, he adds that the profits enable financial institutions to build strong buffers, which are essential since they are the first defensive measure against losses from credit impairment. The banks with those buffers are able to provide for both businesses and households with the necessary financial services, even in the face of detrimental developments. Therefore, profitability ensures a smoother impact of negative shocks on the real economy rather than amplifying (Luis de Guindos, 2019). As a result, understanding the determinants that impact profitability is of vital importance for a stable banking system and the overall economy. It is especially relevant in light of the financial crisis of 2008 and the recent pandemic crisis.

The turmoil caused by the financial crisis of 2008 revealed the banking sector to considerable risks. That is why governments had to intervene, especially the US and European Union, to prevent a new depression and a global disaster. Since this crisis, there has been a lot of discussion surrounding the responsibilities of the banks. Also, understanding how they can be profitable again and restore stability to the economy is of utmost interest. However, in less than fifteen years, we face another global crisis with a different cause, but with a similar outcome. The outbreak of COVID-19 has had an impact on the capital markets and in the banking industry. That is why it is crucial to study the determinants of profitability for financial institutions to overcome these challenges more effectively.

The research on this topic is vast and well-studied in an individual country and multi-panel of countries. For the dependent variable, practitioners focus more on both the return of assets and equity, and the net interest margin. Regarding the determinants, there have been many variables considered to analyze the impact on profitability. Best of our knowledge, one paper analyzes this subject in the Portuguese context as a single country, using ordinary least squares estimations with

fixed effects (Garcia and Guerreiro, 2016). Nevertheless, we extend the variables in the study, use a different methodology, and use a different time frame that is more recent. Therefore, this dissertation aims to add to the literature by analyzing the most documented determinants on Portuguese banks' profitability.

The present dissertation builds on the work by Athanasaglou et al. (2008), Garcia-Herrero et al. (2009), and Dietrich & Wanzenried (2011). We apply a General Method of Moments (GMM) technique to our panel of Portuguese banks due to the persistence of profits and potential problems deriving from endogeneity. This method is employed to analyze the bank-specific (internal) and macroeconomic (external) factors that determine Portuguese banks' profitability. For this purpose, APB (Associação Portuguesa de Bancos) is where we retrieved the data, including available balance sheets and income statements of banks that account for over 90 percent of assets in the Portuguese banking system. Regarding the time frame, we start our analysis from the first semester of 2010 to the last semester of 2019. The choice of the period is to include the subsequent crisis between 2010 to 2014 that Portugal faced (sovereign debt crisis), and it is until 2019 since there is no available information on the year 2020. This is a relevant period to study the factors that most impact profitability because there is a period of recession and economic growth. We use as the main measure of banks' profitability the return on average asset, but also, we present the results with return on average equity.

Our results suggest five main factors that impact our main measure of banks' profitability: capital ratio, operational efficiency, revenue diversification, the percentage of deposits in the balance sheet, and loan loss provisions. We provide evidence that well-capitalized banks are more profitable than undercapitalized banks. Also, as previous results, we show that more efficient banks are more profitable than less efficient banks. Furthermore, banks that present a higher percentage of deposits in their composition tend to be more profitable than banks that receive fewer deposits. Regarding revenue diversification, banks that rely on other revenue sources have a better performance in profitability since they are less exposed and do not rely solely on interest earnings. As for the loan loss provisions ratio, we provide empirical evidence that banks under intervention are less profitable when presenting a higher percentage of loan loss provisions over total loans. Finally, it is worth mention that with ROAE, we find the size to have a negative significant impact on profitability, which means that smaller Portuguese banks are more profitable than larger ones.

Following this brief overview, this dissertation is divided into seven sections. After the introduction, section 2 provides an overview of the history and evolution of the Portuguese banking sector. Section 3 presents a review of the relevant literature. Section 4 focuses on the data and the construction of the explanatory variables. Section 5 focuses on the methodology, which is used to compute the regressions. Section 6 provides the main empirical results of the present dissertation. Finally, section 7 presents the main conclusions, and a thorough summary of the topics addressed.

2. Contextual Background

2.1. Portuguese banking: A brief overview

Following the 1974 revolution, the Portuguese banking sector has experienced an extreme transformation. According to Barros and Modesto (1999), all banks operating in Portugal were private until 1974, only Caixa Geral de Depósitos (CGD) was public, and it continues to be nowadays. However, after the end of the dictatorship, the newly elected government decided to nationalize several banks and other financial institutions. Moreover, in all crucial sectors of the Portuguese economy, the government imposed heavy interventions, which had an impact on their activity. For instance, there were some legal restrictions in the banking sector, namely, fixed loan and deposit interest rates, credit limits, and entry barriers in the industry. Thus, due to all of these barriers, the new private banks had difficulty to enter and compete in this industry (Canhoto, 2004).

Nevertheless, in the mid-1980s, Portugal joined the European Economic Community (EEC) (Alves et al., 2020). A gradual liberalization process in the financial system started along with the banking industry reopening to the private initiative (Mendes & Rebelo, 1999). During this time, the number of banks operating in Portugal increased substantially, which led to a rise in the competition in the banking sector. According to Mendes & Rebelo (1999), "In 1984, only 17 banks (commercial, investment, and savings) existed, that number increasing to 30 in 1990 and 45 in 1995". He further adds that "the number of domestic branches also climbed from 1481 in 1985 to 1990 and 3729, respectively, in 1990 and 1995." Both the creation of new domestic private banks and the commenced activities by several foreign banks in Portugal were the reasons for this notable expansion.

In 2008, the world experienced a severe global economic threat due to the global financial crisis that started in the US. According to Blanchard and Portugal (2017), the financial crisis led to a decrease in exports for Portugal in 2009. Furthermore, the country experienced an increase in the cost of funds, offset in part by the liquidity provision by the Bank of Portugal and the European Central Bank (ECB).

The financial crisis led to severe consequences for Portugal in the upcoming years. Due to an increase in sovereign debt, in spring 2011, the Portuguese government was forced to sign the Economic and Financial Assistance Program (EFAP) with "Troika" which was formed by the ECB,

the European Commission (EC), and the International Monetary Fund (IMF). The agreement included a rescue package amounting to €78 billion to help redirect Portugal to a stable and more healthy economy and to reduce the deficit to 3% of the GDP by 2013 (European Commission, 2011). Since the Portuguese banking sector was fragile during this time, €12 billion from the rescue package was used to recapitalize the banks. However, the EFAP also comprised additional measures relevant to the Portuguese banking system, namely the reduction in the credit-to-deposit ratio to 120% in 2014 of the eight main banking groups. Thus, in subsequent years, Portugal was required to engage in fiscal consolidation to be in the right direction for a prosperous economy.

2.2 Key recent events in the Portuguese banking sector

Since the dataset used in this dissertation comprises banks operating in Portugal, it is also crucial to discuss some key recent events in the Portuguese banking system to better understand and analyze the results.

In 2008, Banco Português de Negócios (BPN) was nationalized and benefited from several aid measures due to accumulated losses over the years (European Commission, 2012). Three years later, Banco BIC bought BPN for € 40 million.

Furthermore, in 2008 Banco Privado Português (BPP) received a € 450 million state guarantee. It should be noted that this was a small bank with less than 1% of the assets of the Portuguese banking sector. However, due to fraud and money laundering, the Bank of Portugal demanded the liquidation of BPP in April 2010 (OECD, 2017).

In 2013, the Portuguese government injected €1.1 billion into Portugal's seventh-biggest bank, which at that time was Banco Internacional do Funchal (BANIF). However, the support was not enough for BANIF to come through their financial problems. Hence, in December 2015, the government decided to sell BANIF to Santander Totta for €150 million. For this sale, the state contributed €2.26 billion to cover future contingencies, of which €489 million came from the resolution fund and €1.76 billion from the state budget. Thus, in 2015, the BANIF resolution measure had an impact on the deficit of 1.4% of GDP (OECD, 2017).

As the second private banking group in Portugal, Banco Espírito Santo (BES) was subject to a resolution measure in 2014. The bank revealed losses amounting to 3.6 billion in the first semester of 2014, which was bigger than expected. Therefore, Banco de Portugal decided to transfer the

toxic assets to a so-called "bad bank" and the rest to the newly created bank, called Novo Banco. The latter received a capital injection from the Portuguese Resolution Fund amounting to €4.9 billion and following a €3.9 billion loan from the Portuguese government. All in all, in 2014, the BES bailout had a budget impact of 2.8% of GDP (OECD, 2017).

According to APB, the banking sector comprises 60 banks (values from December 2019). However, the five biggest Portuguese banks account for 77% of total assets, namely Caixa Geral de Depósitos, Millenium BCP, Santander Totta, Novo Banco, and Banco Português de Investimento.

3. Literature Review

In this section, we review the relevant literature on the determinants of banking profitability.

3.1. Literature on the determinants of bank profitability

The literature is vast regarding the determinants of a bank's profitability. For the sake of the economy, it is crucial to have a sound banking system. Hence, it is important to understand the main factors that influence the profitability of financial institutions. Early studies by Short (1979) and Bourke (1989) inspired many practitioners to examine and identify what are the most important determinants for the bank's profitability. Studies were carried out, addressing this particular topic, following two strains:

- i) banking system of individual countries (Berger et al. (1987), Berger (1995), Neely and Wheelock (1997), Mamatzakis and Remoundos (2003), Athanasoglou et al. (2008), García-Herrero et al. (2009), Dietrich & Wanzenried (2011), Trujillo-Ponce (2013), Garcia & Guerreiro (2016) and Haris et al. (2018))
- ii) panel of countries (Molyneux and Thornton (1992), Demircuc-Kunt and Huizinga (1999), Abreu and Mendes (2001), Staikouras and Wood (2004), Goddard et al. (2004), Athanasoglou et al. (2006), Micco et al. (2007), Petria et al. (2015) and Menicucci and Paolucci (2016)).

The above-mentioned studies present diverse empirical results due to differences in datasets, environments, and time periods. However, one can conclude that there are common factors that affect the profitability of financial institutions. These factors are divided into two categories: controlled by the management and bank-specific variables (internal factors), and those that reflect environmental variables (external factors). Therefore, rather than review previous literature studies based on a panel or individual countries, it may be more appropriate to categorize them according to the two common factors (internal and external) of bank profitability.

Practitioners, throughout the years, have proposed different explanatory variables for both internal and external factors. For instance, Bourke (1989) examined the determinants of bank profitability in twelve countries or territories in Australia, North America, and Europe, and the analysis covers the period of 1972 to 1981. As independent variables for his model, Bourke (1989) used the following ones: staff expense, capital ratios, liquidity ratio, concentration ratio, government

ownership, interest rates, market growth, and inflation. The results showed capital ratios, liquidity ratios, and interest ratios as being positively related to bank profitability, whereas staff expense has an inverse effect.

More recently, Dietrich & Wanzenried (2011) studied the determinants of profitability in a sample of 372 Swiss banks between 1999 to 2009. They used in the model a General Method of Moments estimator technique to account for profit persistence and endogeneity problems. For this model, they included explanatory variables such as capital ratio, operational efficiency, credit quality, yearly growth of deposits, growth of total loans, funding costs, effective tax rate, and Real GDP growth. Dietrich & Wanzenried (2011) found that bank profitability is mainly explained by operational efficiency, funding costs, and the growth of total loans.

As for Trujillo-Ponce (2013), they examined the factors that determine Spanish banks' profitability over the period from 1999 to 2009. They found that loan ratio, customer deposits, operation efficiency, and credit quality had a statistically significant impact on the profitability of Spanish banks. Similarly, Garcia and Guerreiro (2016) studied the profitability of 27 universal banks in Portugal between 2002 to 2011. They concluded that the explanatory variables that influence financial institutions' profitability are capital ratio, operational efficiency, credit quality, yearly growth of deposits, effective tax rate, and real GDP growth.

One can state the diversity of explanatory variables deployed over the years to analyze financial institutions' profitability. We will analyze in our research the following prominent variables in the literature: capital ratio, loan loss provision, size, cost-income ratio, deposits ratio, loans ratio, income diversification, real GDP growth, and term structure. Therefore, it is crucial to review the above-mentioned explanatory variables. We use both internal and external factors, and we will outline the findings and results concerning each variable individually.

Capital Ratio

The capital ratio is crucial to study the relationship between profitability and the capitalization of the financial institution. Practitioners presented empirical evidence that the banks that perform best are those who have a high capital ratio, which means higher equity relative to their assets (Bourke (1989), Demirguc-Kunt and Huizinga (1999), Abreu and Mendes (2001), Goddard et al. (2004), Naceur and Goaied (2001), Pasiouras and Kosmidou (2007) and García-Herrero et al. (2009). As

banks have higher capital ratios, they tend to face lower funding costs due to lower predictive bankruptcy costs. In particular, the studies of Abreu and Mendes (2001) presents that commercial banks in Portugal, Spain, France, and Germany have a higher interest margin and are therefore more profitable. Also, these well-capitalized banks depend less on external funding. Thus, they present a lower leverage risk, which increases the creditworthiness of the financial institution and reduces the cost of funding.

Loan Loss Provision

The ratio of loan loss provision over total loans measures the impact of a bank's asset quality on its profitability. A higher value indicates the poor quality of the loans in the portfolio, which increases the risk and lowers the profitability. Hence, one would expect a negative relationship between this ratio and the bank's profitability. For instance, Miller and Noulas (1997) found that lower loan loss provisions are correlated with higher profit margins. Dietrich & Wanzenried (2011), Truhillo-Ponce (2013), and Menicucci and Paolucci (2016) also corroborated these findings and additionally concluded that more exposure to credit risk lowers profits in Switzerland, Spain, and European Union, respectively. One possible reason could be that commercial banks present a higher accumulation of unpaid loans when exposed to risky loans. Hence, this implies that these loan losses translate to lower returns for many commercial banks (Athanasoglou et al., 2008).

Size

Size has been vastly studied in the literature, and there have been different results regarding the relationship between bank size and profitability. Early studies by Smirlock (1985) and Boyd and Runkle (1993) demonstrate a significant positive relationship between these two variables. Moreover, Camilleri (2005), Pasiouras and Kosmidou (2007), Gul et al. (2011), Saeed (2014) showed the same results in the banks they examined. Therefore, all of this evidence points out that large banks were actually more profitable. This is because larger banks benefit from economies of scale, and they have a higher degree of product and loan diversification than smaller ones (Dietrich & Wanzenried, 2011). Also, there is the argument of too-big-to-fail, which implies that larger banks can benefit from an implicit guarantee, which decreases their cost of funding and enables them to invest in riskier assets (Iannotta et al., 2007). Nevertheless, studies show that size has a negative impact on profitability when banks become extremely large. This is because of agency costs and

other costs related to the management of large financial institutions (Stiroh and Rumble, 2006). Also, Barros et al. (2007) found that larger and diversified banks are more likely to perform poorly, and smaller and more specialized banks can reduce more efficiently asymmetric information problems related to lending. Hence, there is no consensus in the literature over this variable, which is why it is essential to study it in a different context.

Cost-income Ratio

Throughout the years, due to the advances in technology, banks have been more efficient in the way they use their resources to improve their performance. Consequently, as a proxy for operational efficiency, the cost to income ratio has been decreasing, meaning that banks present lower expenses for a given amount of output (Albertazzi and Gambacorta, 2009). Previous studies presented evidence on a positive and highly significant impact of bank operational efficiency on profitability (Athanasoglou et al., 2008; Tan and Floros, 2012; Garcia and Guerreiro, 2015). Therefore, banks that show a good sign of profitability are the ones that present the lowest cost-to-income ratios. Furthermore, Berger (1995) and García-Herrero et al. (2009) found for a large sample of financial institutions that the ability to manage and control the costs (X- efficiency factor) is associated with an improvement in profitability.

The Balance Sheet Structure

The structure of the balance sheet has an impact on the performance of financial institutions. The volume of loans and deposits a bank detains are measures respectively of the efficiency of assets and liability portfolio management (Menicucci and Paolucci, 2016). According to previous literature, total loans over total assets are considered a liquidity indicator. Furthermore, Bashir (2003) and Sufian and Habibullah (2009) present empirical evidence of a positive relationship between liquidity and the profitability of commercial banks. Comparing with other assets, the loans market, particularly credit to firm and households, are riskier and have a better-expected return. Therefore, banks with a higher percentage of loans (greater liquidity risk) are more likely to earn higher profits even though loans entail higher operational costs since they need to be originated and monitored. Nevertheless, more recent studies corroborated and provide a positive relationship between liquidity and profitability (DeYoung and Rice, 2004; Iannotta et al., 2007; Chiorazzo et al., 2008; Trujillo-Ponce, 2013).

Deposits are essential for banks to allocate credit to customers and other institutions. As Lee and Hsieh (2013) suggest, more deposits are likely to originate more loan opportunities for customers, which will generate and increase the banks' profits. Therefore, more deposits are associated with a positive impact on banks' profitability, while low deposits may have an opposite effect. Naceur and Goaid (2001) presented empirical evidence that banks with high deposit levels compared to total assets would lead to good profitability performance. Moreover, empirical results in Chinese banks confirm this relationship (Garcia-Herrero et al., 2009). They suggest that a larger percentage of deposits should increase profitability since deposits constitute a more stable and cheaper funding compared to borrowed funds.

Revenue Diversification

During the last decade, the decline of interest margins has transformed the traditional role of financial institutions and required them to pursue other revenue sources. Initially, commercial banks increase income diversification as banks moved into fee-based business (Elsas et al., 2010). Later, those banks expanded their initial business and entered into new activities such as trading and underwriting insurance contracts (Trujillo-Ponce, 2013). Due to this new change in the landscape, the impact of income diversification is an important determinant to analyze. It has been studied throughout the years, and there are different results for this variable.

Stiroh and Rumble (2006) showed that banks that rely more on non-interest income do not imply an improvement in profitability. Likewise, in Demirgüç and Huizinga (1999) is shown that banks that present in their assets a higher percentage of non-interest earnings tend to be less profitable. In fact, Lepetit et al. (2008) argue that the profit from other activities may not be enough to compensate for the reduction of interest. Nevertheless, Iskandar-Datta and McLaughlin (2007) present evidence that diversified banks have shown higher managerial skills, which will lead to higher performance. Furthermore, Chiorazzo et al. (2008) present a positive relationship between revenue diversification and profitability as banks have higher margins from non-interest businesses.

Real GDP growth

A banking system that faces a depressed economic condition will tend to have lower performance because there will be a decrease in the quality of loans, which will increase the provisions. On the

contrary, an environment with economic growth will have a positive impact on profitability. According to Bikker and Hu (2002) and Athanasoglou et al. (2008), there is an increase in the demand for lending when there is economic growth, which will positively affect the banks' performance.

Term Structure of Interest Rates

In the literature, the Term Structure of Interest rates is the difference between the interest rate of a 5-year and a 2-year treasury bill. According to Dietrich & Wanzenried (2011), commercial banks usually finance long-term loans with short-term deposits. This maturity transformation should allow financial institutions to earn a spread and higher profits in an environment where the yield curve slope is positive (Bologna, 2018). Recent studies by Garcia and Guerreiro (2015) and by Dietrich & Wanzenried (2011) provide empirical evidence that a steeper yield curve (bigger the difference of 5y and 2y interest rate) has a positive impact on Portuguese and Swiss banks, respectively.

The present dissertation contributes to the literature mentioned above by analyzing the impact of the most relevant determinants in the Portuguese banking sector.

4. Variable Selection & Data

4.1. Variables

In this section, we outline both the dependent and the independent variable that was selected for the analysis of the bank profitability.

4.1.1. Dependent Variables

In the literature, we can find different ways to measure a bank's profitability. In this dissertation, we choose both ROAA and ROAE, which are the most used in the banking literature.

Return on average assets (ROAA) is our main profitability measure. ROAA is computed as a ratio between net income before taxes and average of total assets, expressed in percentage. Following Trujillo-Ponce (2013), we use pre-tax values to avoid distortions of our conclusions due to the tax system. Also, it should be noted that we used average assets to capture changes during a semester. This ratio is a measure of the ability of the management of a bank to generate profits from the bank's assets. According to Golin (2013), ROAA has emerged as an important ratio to measure profitability, and it is the common one in the literature.

Return on average equity (ROAE), which is the ratio between net income before tax and average equity. It measures the earnings that generate from the equity investments. Although there are many studies with ROAE, this metric dismisses the information on higher risk that is related to high leverage (Athanasoglou et al., 2008). That is why we use ROAA as the main indicator of profitability. Nevertheless, ROAE is useful to compare the results that we obtain.

4.1.2. Independent Variables

This section presents the independent variables that were chosen to analyze bank profitability. There are bank-specific (internal) and macroeconomic (external) variables.

Bank-specific variables

The present dissertation analyzes seven bank-specific variables:

Capital ratio measures the capital of the bank, and it is computed by dividing the total equity capital by total assets. Empirical evidence shows that the best performing banks are those that present a high capital ratio in their structure (Abreu and Mendes, 2001; Pasiouras and Kosmidou, 2007; García-Herrero et al., 2009). Therefore, we expect a positive effect on bank profitability.

Loan loss provision is a proxy for credit quality. It is the ratio of loan loss provisions over total loans. A bank that presents a high loan loss ratio indicates a low credit quality, which negatively affects profitability. Hence, for this ratio, we expect a negative effect.

Size is used as the logarithm of total assets. As the literature suggests, there are mixed results. Some suggest that larger banks can benefit from economies of scale (Pasiouras and Kosmidou, 2007; Gul et al., 2011; Saeed, 2014). Others argue that larger financial institutions have higher agency costs and other costs related to management (Stiroh and Rumble, 2006; Pasiouras and Kosmidou, 2007). Therefore, there is no consensus over the effect on profitability.

Cost-income ratio is a proxy for bank efficiency. It is the ratio of operating costs, namely staff salaries and administrative costs, over total operating income. The expected sign of the coefficient is negative (García-Herrero et al., 2009).

Loan ratio is the ratio of total loans to total assets, which is useful to study the impact of the loans on the bank profitability. Literature suggests that banks with large amounts of loans present a better performance in profitability (DeYoung and Rice, 2004; Trujillo-Ponce, 2013). Thus, we expect a positive sign in the coefficient of this variable.

Deposit Ratio is the ratio of total deposits to total assets. Empirical evidence by Ben Naceur and Goaid (2001), shows that banks with high levels of deposits lead to more profits. Therefore, it is expected a positive effect on profitability.

Revenue Diversification is the ratio of non-interest income to total income. With this ratio, we can analyze if a bank that is more diversifiable on their income has an impact on profitability. Since there is no consensus in the literature, we are not able to infer the sign of this coefficient.

Macroeconomic variables

Besides the internal factors described previously, we add two external factors to analyze the impact on profitability:

Real GDP Growth is a measure of economic conditions in a particular country. An environment with economic growth is expected to have a positive impact on bank profitability. Hence, we expect a positive effect on the dependent variable.

Term structure of interest rates is the difference in the interest rate of a 5y and 2 years Treasury bill in euros issued by the Portuguese government. As stated by Dietrich & Wanzenried (2011),

“we expect a steeper yield curve to affect the profitability positively “, since banks will earn higher spread, and this will increase profitability.

Table 1: Definition of the variables used in the model

Explanatory Variables		Expected Effect
Bank-specific Characteristics		
Capital Ratio	Equity over total assets (%)	+
Loan Loss Provision	Loan loss provisions over total loans (%)	-
Size	Logarithm of total assets (M)	+/-
Cost-income ratio	Operating costs over total operating income(%)	-
Loan ratio	Total loans over total assets (%)	+
Deposit Ratio	Total deposits over total assets (%)	+
Revenue Diversification	Non-interest income over total income (%)	+/-
Macroeconomic Characteristics		
Real GDP growth	GDP growth rate (%)	+
Term Structure of interest rates	Difference between the interest rate of a 5y and a 2y treasury bill issued by the Portuguese Government (%)	+

4.2. Data

The core data source for the internal determinants is the APB (Associação Portuguesa de Bancos), which provides annual and semester financial information of banks operating in Portugal. This dataset covers roughly 90% of the assets in the banking system of Portugal. We use semester data because this would increase our observations for the analysis. The bank-specific characteristics were deducted from the income statement and balance sheet of the banks. Additionally, we use macroeconomic variables to explain the profitability of the Portuguese banks. From PorData, we extracted the real GDP growth. Since we use semester data for banks, we computed the average every year for real GDP growth. The 5y and 2y bonds issued by the Portuguese government were extracted from the Banco de Portugal.

The panel is composed of semester data for 40 banks operating in Portugal from the first semester of 2010 to the last semester of 2019, which gives a total of 496 observations. We use an unbalanced dataset because some banks were under some intervention (merger, acquisitions, or bankruptcy), and some banks do not have information every semester. Moreover, in this paper, we use unconsolidated statements because it prevents relevant differences in the balance sheet and income statement of the subsidiaries and respective headquarters to negate each other (Garcia-Herrero et al., 2009). The sample that we used in this analysis was less than the total observations available in the APB database. From this dataset, we had to remove some banks, which were filtered using two criteria: i) observations that did not have any information that would be necessary to estimate profitability, ii) outliers. Following Garcia-Herrero et al. (2009), we consider outliers to be values that have cumulative frequency under 1 percent or above 99 percent. Also, their deviation from the mean is three times higher than the variables' standard deviation.

In table 1, it is presented the summary description of all variables that will be used in the analysis. We will briefly highlight a few interesting facts. On average, we have a sample of banks that present 0.4% on the ROAA and 5% on ROAE. It should be noted that both ROAA and ROAE might have negative values, and this is due to the fact some banks present negative net income in their income statement. Regarding ROAE, there is in the sample banks with a minimum negative value of 84% and a maximum value of 140% (scattered metric). Let us analyze the independent variables. On average, the capital ratio is 9%. One can observe that the best-capitalized bank in our sample presents 46%, whereas the least capitalized presents 0.2%. Regarding efficiency, there is one bank

that has a ratio of 231% due to high administrative costs. On contrary, there is a bank with a minimum value of cost-to-income of 5% due to low operating costs. On average, diversification amounts to 38%. The maximum value of diversification in this sample is 95%, and the lowest one is 0.5%. The highest value is due to high non-interest income relative to total income. Hence, banks rely not only on income from interest but from commissions mainly. Finally, it should be noted that there are banks in the sample that have a high credit quality, by presenting a very low value of loan loss provisions.

Table 2: Descriptive Statistics

Dependent Variables	Mean	Median	Std. Dev	Min	Max
ROAA	0.43	0.27	1.47	-5.70	8.87
ROAE	4.95	3.92	23.05	-84.23	140.09
Independent Variables	Mean	Median	Std. Dev	Min	Max
Internal Factors					
Equity-Assets	9.39	7.58	6.59	0.19	46.34
Size (M)	6.55	6.37	0.76	3.36	8.05
Cost-to-income	62.99	59.76	28.96	5.31	231.34
Loans/TA	61.72	64.86	20.90	4.39	96.98
Deposits/TA	69.10	72.66	20.86	7.90	98.60
Diversification	37.82	32.82	20.42	0.49	95.17
LLP/TL	1.26	0.75	2.57	0.00	28.65
External Factors					
Term Structure	1.12	1.10	0.58	0.02	2.52
GDP	0.36	0.87	1.13	-2.03	1.76

5. Methodology

In this section, we will go through the methodology that we used in this dissertation. Since the objective is to analyze the effects of bank-specific and macroeconomics factors on the bank profitability, we follow Garcia-Herrero et al. (2009) and Dietrich & Wanzenried (2011) and use a linear model given by:

$$\pi_{it} = c + \sum_{l=1}^L \beta_l X_{it}^l + \sum_{m=1}^M \beta_m X_{it}^m + \varepsilon_{it}, \quad \varepsilon_{it} = v_i + u_{it},$$

where π_{it} is the profitability of bank i at time t , with $i=1, \dots, N$, $t=1, \dots, T$; c is a constant; X_{it}^l are the bank-specific variables; X_{it}^m are the macroeconomic variables; and ε_{it} is the disturbance, with v_i as the unobserved bank-specific effect and u_{it} the idiosyncratic error.

As banks' profits tend to persist over time, Berger et al. (2000) suggest that this reflects an impediment to market competition and informational opacity. Hence, due to the persistence of profits, we employ a dynamic specification, which includes a lagged dependent variable among the regressors. However, since we are using semester data, we will lag the dependent variable for two periods. Besides, the Arellano and Bond test for autocorrelation for second-order provides us a better result under this specification rather than lagging only one period. Then the dynamic model is given by:

$$\pi_{it} = c + \delta \pi_{i,t-2} + \sum_{l=1}^L \beta_l X_{it}^l + \sum_{m=1}^M \beta_m X_{it}^m + \varepsilon_{it},$$

where $\pi_{i,t-2}$ is the profitability lagged two periods and δ measures the speed of adjustment to equilibrium. The value of δ is between 0 and 1, which specifies that profitability is persistent over time but will return to its normal value (equilibrium). Hence, a value that is close to 0 indicates that the industry presents a fairly competitive market structure and a high speed of adjustment. In contrast, a value close to 1 denotes a low-speed adjustment and implies that the industry is less competitive.

5.1. Econometric Model

Literature normally applies the least squares estimation methods in a static model. However, Baltagi (2008) suggests that the estimations methods produced inconsistent estimates and biased. As a reason, the lagged dependent variable is correlated with the fixed effects in the error term,

which results in a problem known as “dynamic panel bias” (Nickell 1981). Hence, in this present dissertation, we employ techniques to estimate dynamic models to deal with these problems. Furthermore, it should be noted that there are some challenges when estimating bank profitability. One of them is the potential problem of endogeneity between variables. For instance, more profitable banks have the resources to increase their equity more easily than others by retaining profits (Garcia Herrero et al., 2009). Moreover, these banks can allocate more money for advertising to attract more customers, impacting profitability. Nevertheless, the causality can go in the opposite direction as well. For example, more profitable banks can hire more employees, and this, in turn, can reduce their operational efficiency (Dietrich & Wanzenried, 2011). Finally, some characteristics are more challenging to measure, but they will also impact the bank’s profitability (unobserved heterogeneity).

Thus, to address these problems, we employ the Generalized Method of Moments (GMM) following Arellano and Bover (1995) and Blundell and Bond (1998), which is known as the system GMM estimator. This estimator solves both difference and level equations, which means that this estimator uses lagged values of the dependent variable and other regressors that could suffer from endogeneity, in levels, and in differences as instruments. Therefore, this estimator controls for the persistence of the dependent variable (bank profitability) for unobserved heterogeneity and potential endogeneity. As far as we know, there have not been any studies that use this methodology for analyzing the determinants of bank profitability in the Portuguese banking system.

As a first step, following Athanasaglou et al. (2008) and literature, we test whether the capital ratio is better modeled as an endogenous variable or as an instrumental variable. We run the same model twice; first, we treat capital ratio as endogenous, and the second time we treat this variable as an instrumental variable. Overall, the results were better for both ROAA and ROAE when we used capital ratio as an instrumental variable.

Also, we perform the OLS methodology to compare the results and to allow comparison with other studies. The results are relatively similar, with differences in significance with some variables.

6. Results

In this section, we will present the results for the profitability measure of ROAA and ROAE and discuss the determinants that most influence the profits of the Portuguese banking system.

6.1. ROAA

Table 3 reports the empirical results for ROAA, the measure of bank profitability during the first semester of 2010 to the last semester of 2019. The first two columns present the results when all 40 banks are included. Also, since we want to analyze the banks that were in any intervention, we split the data into two groups: the first one (columns 3 and 4) we study the sound banks; the second group (5 and 6) are the banks that indeed were subject of an acquisition, merger, or bankruptcy. We end up with two distinctive samples, and the reason we split is to investigate if there are determinants that behave differently when we regress in each model. Moreover, to analyze the coefficients and their significance, we firstly regress only with the bank-specific factors (columns 1,3, and 5). In the next step, we report the estimates with both the bank-specific and macroeconomic variables (columns 2,4, and 6).

One can observe stable coefficients in the model. The Hansen test shows no evidence of over-identifying restrictions. As Roodman (2009) suggests, we should "not take comfort in a Hansen test p-value below 0.1". Furthermore, some models indicate that a negative first-order autocorrelation is present. Nevertheless, these values do not mean that the estimates are inconsistent. If second-order autocorrelation were present, that would imply inconsistency (Arellano and Bond, 1991), but we can reject this case by the test for AR (2) errors.

The lagged dependent variable, which is a measure of the persistence of the profitability of ROAA, is statistically significant in every model and a good reason to use this dynamic specification. One can observe that this lagged value coefficient ranges from 0.40 to 0.50, which means there is a moderate persistence in bank profitability and similar to previous studies in European Banking sector (Athanasoglou et al., 2008; Trujillo-Ponce, 2013).

Regarding the bank-specific characteristics, one can observe that capitalization positively impacts the banks' profitability in all models. However, the statistical significance is much stronger when we use all the banks in the sample and banks under some intervention, at the 1% level. The positive

relationship goes in line with our expected results. Thus, banks with better solvency (more capital) depend less on external funding, presenting a lower risk and can reduce the cost of funding. In contrast, undercapitalized banks are likely to have more leverage and risk, which increases their borrowing costs. One can conclude that banks that show a strong capital structure are the ones who achieve more profitability, and it is crucial for the soundness of the financial institutions.

The coefficient of size, measured by the logarithm of total assets, has a negative value, but it is not statistically significant. Hence, it is not conclusive the relationship between this variable and bank profitability.

As expected, the cost to income ratio has a statistically significant negative impact on ROAA at a 1 percent level in all models. Hence, one can conclude that efficient banks translate to an improvement in their profitability. The results of this variable stand in line with the Athanasoglou et al. (2008) and Dietrich & Wanzenried (2011), which decreasing the cost-to-income ratio can explain part of the profitability.

The ratio between total loans and total assets shows a positive but insignificant relationship with ROAA. This means that banks with a higher value of loans tend to perform better in terms of profitability. However, this variable does not present a statistically significant effect, which is not conclusive the relationship.

Turning to other independent variables, the deposit ratio of banks has a positive relationship with profitability. One can observe that the statistical significance increases when it is only used the bank-specific variables in the regression for columns 1 and 3, at a 5 percent significance level. Therefore, banks that rely more on deposits to obtain their funding source can achieve a better ROAA. However, when we add the macroeconomic variables into the model, the statistical significance decreases. As for banks under intervention, this variable does not present a statistically significant effect, which means we are not able to make any conclusions. Furthermore, since there is a high correlation with this variable with total loans, for robustness, we regress without the total loans, and the results are in the same view, with statistically significant for the model when we use all banks and the ones without intervention. Regarding the model with banks that had faced some intervention, we find a positive effect, but it is not statistically significant, which means it is not conclusive.

As for revenue diversification, one can observe a positive relationship with ROAA when used all banks and those without intervention in the analysis (at a 5 percent level). Hence, banks that rely on non-interest income are associated with higher profitability. However, for the group with banks with intervention, we find no statistical significance in this variable, thus we are not able to extract a conclusion from here. All in all, for the 40 banks and the ones without intervention, the results stand in line with Chiorazzo et al. (2008) that non-interest income impacts positively bank profitability.

Finally, as a proxy of credit quality, the loan loss provision has different results across models. When we consider all the banks and the subsample of banks without intervention, one can observe a positive relationship, but statistically insignificant. However, the model with banks under intervention suggests that loan loss provisions have a negative effect on bank profitability at a 5 percent level. The crisis of 2008 was felt in the subsequent years in Portugal and loan loss provisions increased during that period. More particularly for banks under intervention, which were already struggling, they needed to put more money aside to cover for credit losses, reflecting a negative impact on profitability.

Concerning the macroeconomic variables, the real GDP growth rate positively impacts profitability, but it is not statistically significant. Moreover, the term structure of interest rates, which is the difference between a 5y and 2years bond issued by the Portuguese government, is not significantly correlated with the profitability. Hence, both variables are not relevant to explain banks' profitability when taking into account other bank-specific characteristics.

Table 3: Results from return on average assets (ROAA) as dependent variable

Dependent Variable: ROAA	Regression from 2010-2019		Regression without banks under intervention		Regression with banks under intervention	
	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors
Var. Dep, lag(2)	0.4781*** (0.1500)	0.4779*** (0.1525)	0.4215*** (0.1413)	0.4197*** (0.1381)	0.4091*** (0.1324)	0.4537*** (0.1704)
Equity over Total Assets	0.0456*** (0.0160)	0.0431** (0.0181)	0.0190** (0.0281)	0.0248** (0.0268)	0.0512*** (0.0138)	0.0452** (0.0218)
Size	-0.0021 (0.0014)	-0.0022 (0.0016)	-0.0014 (0.0018)	-0.0007 (0.0020)	-0.0024 (0.0019)	-0.0031 (0.0023)
Cost-to-income ratio	-0.0084** (0.0034)	-0.0089*** (0.0033)	-0.0113*** (0.0039)	-0.0127*** (0.0040)	-0.0097*** (0.0023)	-0.0103*** (0.0030)
Total Loans over Total Assets	-0.007 (0.0040)	0.0003 (0.0041)	-0.0090 (0.0072)	-0.0098 (0.0076)	0.0072 (0.0056)	0.0058 (0.0060)
Total Deposits over Total Assets	0.0095** (0.0041)	0.0082* (0.0050)	0.0120** (0.0058)	0.0144* (0.0076)	0.0043 (0.0049)	0.0033 (0.0064)
Diversification	0.0083** (0.0040)	0.0087** (0.0045)	0.0124** (0.0052)	0.0134** (0.0067)	0.0053 (0.0064)	0.0068 (0.0083)
Loan Loss Provisions over Total Loans	0.0248 (0.0787)	0.2560 (0.0811)	0.1212 (0.0814)	0.1161 (0.0814)	-0.0794** (0.0727)	-0.0943** (0.0710)
Term Structure of interest rates		-0.0573 (0.0784)		-0.0487 (0.0979)		-0.0430 (0.1389)
Real GDP growth		-0.0007 (0.0677)		-0.1046 (0.0883)		0.0130 (0.0985)
Constant	0.0072 (0.0125)	0.0089 (0.0138)	0.0084 (0.0147)	0.0036 (0.0154)	0.0090 (0.0142)	0.0164 (0.0216)
Hansen Test (p-value)	(0.388)	(0.430)	(0.369)	(0.423)	(0.695)	(0.787)
AB test AR(1)(p-value)	(0.001)	(0.001)	(0.042)	(0.030)	(0.008)	(0.013)
AB test AR(2)(p-value)	(0.295)	(0.313)	(0.410)	(0.399)	(0.317)	(0.452)

The table reports the results from the GMM estimations to analyze the impact of bank-specific and macroeconomic factors on Portuguese banks' profitability. As dependent variables, we use the return on average assets ROAA. In parentheses are the robust standard errors. Coefficients are significantly different from zero at 1%, 5% and 10% level and are marked with ***, **, * respectively. Hansen is a test of over-identifying restrictions. AB test AR (1) and AR (2) are the Arellano-Bond test with H_0 : no autocorrelation; p-value in parentheses.

6.2. ROAE

Table 4 presents the empirical results for the second measure of profitability (ROAE) during the first semester of 2010 to the last semester of 2019. As previously done with ROAA, we estimate the model with all the banks considered in the sample, and then separately for the two subsamples: banks with and without intervention.

Again, one can observe stable coefficients. There is no evidence of over-identifying restrictions since the Hansen test p-value is above 0.1. As for the Arellano and Bond autocorrelation test, some models indicate a first-order autocorrelation present. However, like ROAA, second-order autocorrelation is not present, which we can reject that our estimates are inconsistent (Arellano and Bond, 1991).

To a large extent, some key results above-discussed are confirmed with the second measure of profitability. Nevertheless, there are differences, and it is important to highlight and discuss them. Concerning capital ratio, we found no impact on ROAE, as it is not statistically significant in either sample.

When ROAE is considered as the dependent variable, the main difference is the significance of size, which is statically significant in every model. The results, with all banks included, show a negative relation between size and profitability (at a level of 0.01). As for the rest of the models, the negative relationship is significant at a 5 percent level. The results suggest that in the Portuguese Banking system, smaller banks succeed to perform better than larger ones. One possible reason is the fact that larger banks face higher agency costs. Besides, since these banks employ more human resources, they tend to face higher management costs, which could negatively affect the profitability.

The coefficient of cost-to-income ratio, which measures the credit quality of banks, is negative and highly significant in all models, at 1 percent level. These results come in line with previous results from ROAA, which corroborates the idea that efficiency matters for financial institutions' profitability. The results follow previous expectations and stand in line with earlier empirical results, namely Athanasoglou et al. (2008), Dietrich & Wanzenried (2011), and Garcia and Guerreiro (2015), which the latter studied the bank profitability in the Portuguese context.

As was expected, the diversification income had a positive coefficient, and it is statistically significant in all models at a 5 percent level. However, one can observe an increase in significance with banks under intervention and when included macroeconomic variables (at a level of 0.01). Thus, in the subsample of banks that are under some type of intervention, the banks that have a better performance in terms of profitability are the ones who present a diversification in their income and do not rely solely on revenue coming from interest. Furthermore, in a low-interest-rate environment, different sources of revenue can potentially help financial institutions to create more revenue and, thus, increasing their profitability.

Table 4: Results from return on average equity (ROAE) as dependent variable

Dependent Variable: ROAE	Regression from 2010-2019		Regression without banks under intervention		Regression with banks under intervention	
	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors
Var. Dep, lag(2)	0.2994** (0.1314)	0.3016** (0.1354)	0.3353*** (0.1143)	0.3526*** (0.1154)	0.1842* (0.2200)	0.2229** (0.1922)
Equity over Total Assets	-0.0707 (0.1969)	-0.1074 (0.2445)	-0.3917 (0.2139)	-0.3775 (0.2127)	0.0777 (0.4781)	0.1648 (0.5752)
Size	-0.0516*** (0.0180)	-0.0513*** (0.0185)	-0.0390** (0.0228)	-0.0399** (0.0253)	-0.0668** (0.0358)	-0.0580** (0.0353)
Cost-to-income ratio	-0.1933*** (0.0461)	-0.1773*** (0.0406)	-0.1969*** (0.0479)	-0.1828*** (0.0562)	-0.1881*** (0.0711)	-0.2216*** (0.0778)
Total Loans over Total Assets	0.0857 (0.0837)	0.0812 (0.0790)	-0.0934 (0.0823)	-0.0708 (0.1024)	0.1774 (0.1366)	0.1944 (0.1410)
Total Deposits over Total Assets	0.1283** (0.0601)	0.0949** (0.0806)	0.1995** (0.0888)	0.1500* (0.1178)	0.1480 (0.1787)	0.1588 (0.2423)
Diversification	0.1857** (0.0898)	0.1763** (0.0890)	0.1358** (0.0683)	0.1431** (0.0682)	0.3793** (0.1784)	0.4154*** (0.1788)
Loan Loss Provisions over Total Assets	0.2523 (0.5688)	0.2130 (0.5677)	0.8481 (0.6108)	0.8502 (0.5641)	-1.5298 (1.1004)	-1.4848 (1.0306)
Term Structure of interest rates		-1.3721 (1.0404)		-2.8513 (1.1231)		-2.1863 (1.8790)
Real GDP growth		0.5981 (0.9345)		-0.0132 (1.2038)		-0.3696 (1.2511)
Constant	0.2772** (0.1324)	0.3120** (0.1619)	0.2973** (0.1474)	0.3420* (0.1822)	0.2217 (0.3775)	0.1890 (0.5736)
Hansen Test (p-value)	(0.572)	(0.578)	(0.594)	(0.621)	(0.989)	(0.999)
AB test AR(1)(p-value)	(0.014)	(0.014)	(0.028)	(0.029)	(0.116)	(0.100)
AB test AR(2)(p-value)	(0.285)	(0.290)	(0.288)	(0.284)	(0.682)	(0.599)

The table reports the results from the GMM estimations to analyze the impact of bank-specific and macroeconomic factors on Portuguese banks' profitability. As dependent variables, we use the return on average assets ROAA. In parentheses are the robust standard errors. Coefficients are significantly different from zero at 1%, 5% and 10% level and are marked with ***, **, * respectively. Hansen is a test of over-identifying restrictions. AB test AR (1) and AR (2) are the Arellano-Bond test with H_0 : no autocorrelation; p-value in parentheses.

7. Conclusions

The aim of this dissertation is to analyze which and how internal (bank-specific) and external (macroeconomic) factors affect the profitability of Portuguese banks. Given that banks are crucial for the financial system and overall economy, a sound and profitable banking sector must be achieved as an economic objective (Garcia and Guerreiro, 2015). Recently, the environment in which banks operate has been transforming rapidly, creating numerous challenges for financial institutions (Pasiouras and Kosmidou, 2007). Therefore, it is of vital importance for academic research along with bank management and supervisors to study the determinants of bank profitability. Following the recent research on this topic, this dissertation is included in studies on the profitability of individual countries' banking systems, which examines both internal and external determinants.

The analyzes use balance sheet and income statement data from 40 banks over the first semester of 2010 to the last semester of 2019. Therefore, with this dataset, we provide more recent evidence to the literature. Besides, it is a time that includes a period of recession (from 2010 until 2014) and economic growth. In addition, since large differences exist in profitability among banks in our sample, we divide it into two subsamples: banks that were under intervention (acquisition, merger, and bankruptcy); and sound banks. This division was done to study if there are determinants that have different impacts on whether the banks analyzed are under distress or are more stable.

In the present dissertation, we employ a dynamic model specification, known as the Generalized Method of Moments, which controls for profit persistence. This methodology has not been applied when studying the profitability of the Portuguese banking sector. Furthermore, we used a more recent dataset, which allows us to provide new insights on Portuguese banks. Our dependent variables are the return on average assets as well as the return on average equity since these two variables are the most used in the literature of bank profitability. Overall, both with ROAA and ROAE, the results of the models confirm to a great extent some of the key empirical results of recent literature.

Using both dependent variables, one can observe that CIR has a significant negative impact on profitability as was expected. More efficient banks are more profitable than banks that less efficient. Moreover, for sound banks, we found that the deposits ratio has a significant positive

impact on profitability. Hence, banks with more deposits are more profitable than banks with fewer deposits over total assets. However, there is no clear relationship with this variable when we estimate with banks under intervention. In addition, we found that diversification income has a positive coefficient in both dependent variables, but stronger statistically for ROAE. This means that banks that diversify their income and do not rely solely on interest-income translate to higher profitability.

There are variables that behave differently under different measures of profitability. Regarding capital ratio, we found a positive statistical significance in every model under ROAA, but with a higher significance level for banks under intervention than sound banks. These results confirm that well-capitalized banks have higher profitability than under-capitalized banks. Furthermore, under the measure ROAE, we found that size has a significant negative impact on Portuguese banks' profitability. This is a curious finding, which means that smaller Portuguese banks have higher profitability than the larger ones. Finally, loan loss provisions only have a significant negative impact on profitability measure ROAA when we regress with banks under intervention. In this subsample, banks present higher and diverse values of LLP, which could be a reason why it is only significant in this model. Hence, this means that banks that put more money aside to cover for losses have lower profitability than banks that have a lower ratio, as is expected. All in all, these results meet our previous expectations and literature, except for size, as there is no consensus among practitioners regarding this variable.

Our study does not confirm that total loans are related with profitability, as there is no statistical evidence with any models. Furthermore, we are not able to make some conclusions regarding macroeconomic variables, as there is no significance in the coefficients.

It should be noted that there are some limitations to this study. As we employ the system GMM, in order to give better estimates, we should add more bank observations each period. Comparing with other papers that use the same methodology, our study presents fewer observations. Nevertheless, we employ the OLS estimator to allow comparison with other studies and to compare with the system GMM results.

In terms of suggestions for future research, it would be interesting to analyze further the optimal size of banks with the best profitability. As our results suggest, increasing the size does not translate

to higher profitability for banks. Also, to include more determinants in the model, namely, the impact of different board of executives in Portuguese banks' profitability.

To conclude, the present dissertation added further understanding of which determinants affect Portuguese banks' profitability. This study is especially relevant in a period of global crisis due to the pandemic. It is now more important to understand what factors impact banks' profitability to overcome these challenges and achieve a stable banking system, thus improving the economy.

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9. Appendices

	<i>ROAA</i>	<i>ROAE</i>	<i>Equity-to-Assets</i>	<i>SIZE</i>	<i>cost-to-income</i>	<i>Loans/TA</i>	<i>Deposits/TA</i>	<i>Diversification</i>	<i>LLP/TL</i>	<i>Term Structure</i>	<i>GDP</i>
ROAA	1										
ROAE	0,6467	1									
Equity-to-Assets	0,3387	0,0101	1								
SIZE	-0,3218	-0,1960	-0,3685	1							
cost-to-income	-0,1853	-0,1617	-0,0875	-0,1557	1						
Loans/TA	-0,1784	0,0786	-0,3617	0,1935	-0,0124	1					
Deposits/TA	-0,0226	0,1585	-0,4118	-0,0207	0,2085	0,3984	1				
Diversification	0,2510	0,1477	0,2761	-0,3313	0,3796	-0,2088	0,1416	1			
LLP/TL	0,0013	-0,0471	0,2620	-0,0090	0,2362	-0,3827	-0,2594	0,3080	1		
Term Structure	-0,0467	-0,0965	0,0004	-0,0038	0,0765	-0,0701	-0,1872	-0,0041	0,0186	1	
GDP	0,1263	0,1414	0,1159	-0,0104	-0,0427	0,0414	0,2700	0,2268	0,0254	-0,4191	1

Table 5: Correlation Table

Dependent Variable: ROAA	Regression from 2010-2019		Regression without banks under intervention		Regression with banks under intervention	
	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors
Var. Dep, lag(2)	0.4982*** (0.0410)	0.4989*** (0.0411)	0.4618*** (0.0430)	0.4592*** (0.0430)	0.4878*** (0.1192)	0.4765*** (0.1217)
Equity over Total Assets	0.0470*** (0.0106)	0.0492*** (0.0111)	0.0219 (0.0146)	0.0282* (0.0152)	0.0527*** (0.0185)	0.0523*** (0.0187)
Size	-0.0012 (0.0008)	-0.0011 (0.009)	-0.0011 (0.0010)	-0.0008 (0.0010)	-0.0028 (0.0018)	-0.0030 (0.0018)
Cost-to-income ratio	-0.0088*** (0.0022)	-0.0090*** (0.0023)	-0.0109*** (0.0027)	-0.0115*** (0.0028)	-0.0083** (0.0038)	-0.0078** (0.0040)
Total Loans over Total Assets	-0.0017 (0.0031)	-0.0018 (0.0031)	-0.0085* (0.0046)	-0.0089* (0.0046)	0.0032 (0.0063)	0.0030 (0.0064)
Total Deposits over Total Assets	0.0085** (0.0034)	0.0093** (0.0037)	0.0114** (0.0048)	0.0142*** (0.0053)	0.0047 (0.0057)	0.0040 (0.0058)
Diversification	0.0106*** (0.0032)	0.0113*** (0.0033)	0.0127*** (0.0037)	0.0138*** (0.0038)	0.0055 (0.0069)	0.0046 (0.0071)
Loan Loss Provisions over Total Loans	0.0508 (0.0294)	0.0498 (0.0295)	0.1203 (0.0342)	0.1197 (0.342)	-0.0958* (0.0556)	-0.0970* (0.0560)
Term Structure of interest rates		-0.0625 (0.0948)		-0.0695 (0.1174)		-0.6402 (0.1538)
Real GDP growth		-0.0468 (0.0568)		-0.1085 (0.0710)		0.0386 (0.0941)
Constant	0.0018 (0.0069)	0.0010 (0.0073)	0.0055 (0.0082)	0.0026 (0.0086)	0.0135 (0.0146)	0.0159 (0.0151)

Table 6: OLS Regressions- ROAA as dependent variable. Coefficients are significantly different from zero at 1%, 5% and 10% level and are marked with ***, **, * respectively.

Dependent Variable: ROAE	Regression from 2010-2019		Regression without banks under intervention		Regression with banks under intervention	
	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors	Bank-specific factors	Bank and Market-specific Factors
Var. Dep, lag(2)	0.4638*** (0.0418)	0.4612*** (0.0419)	0.5537*** (0.0455)	0.5515*** (0.0456)	0.2359*** (0.0873)	0.2334*** (0.0884)
Equity over Total Assets	0.0475 (0.1669)	0.0067 (0.1747)	-0.2102 (0.2086)	-0.2553 (0.2176)	-0.1201 (0.3444)	-0.1380 (0.3519)
Size	-0.0336** (0.0134)	-0.0353** (0.0137)	-0.0238* (0.0139)	-0.0251* (0.0141)	-0.0503 (0.0340)	-0.0516 (0.0345)
Cost-to-income ratio	-0.1669*** (0.0355)	-0.1597*** (0.0361)	-0.1720*** (0.0648)	-0.1635*** (0.0396)	-0.2034*** (0.0722)	-0.1980*** (0.0745)
Total Loans over Total Assets	0.0367 (0.0499)	0.0386 (0.0499)	-0.0780 (0.0648)	-0.0734 (0.0650)	0.2740** (0.1267)	0.2733** (0.1280)
Total Deposits over Total Assets	0.1156** (0.0534)	0.0903 (0.0585)	0.1634** (0.0681)	0.1292* (0.0754)	0.0560 (0.1092)	0.0473 (0.1129)
Diversification	0.1859*** (0.0513)	0.1817*** (0.0527)	0.1460*** (0.0522)	0.1484*** (0.0536)	0.3474** (0.1344)	0.3380** (0.1382)
Loan Loss Provisions over Total Assets	0.4578 (0.4704)	0.4410 (0.4710)	0.9158 (0.4898)	0.8847 (0.4909)	-0.8337 (1.0691)	-0.8372 (1.0779)
Term Structure of interest rates		-1.4882 (1.5120)		-1.6508 (1.6792)		0.0046 (1.9737)
Real GDP growth		0.4175 (0.9064)		0.4067 (1.0132)		0.5983 (1.8010)
Constant	0.1579 (0.1104)	0.2024* (0.1165)	0.1674 (0.1181)	0.2124* (0.1244)	0.1508 (0.2777)	0.1680 (0.2859)

Table 7: OLS Regressions- ROAE as dependent variable. Coefficients are significantly different from zero at 1%, 5% and 10% level and are marked with ***, **, * respectively.