MASTER'S IN MANAGEMENT (MIM)

MASTERS FINAL WORK

PROJECT

THE IMPACT OF NPL ON A BANK'S PROFITABILITY IN PORTUGAL

MARIA LEONOR LACERDA PETRACCHI R. SARMENTO

SUPERVISOR: PROF. JOÃO MANUEL JORGE ESTÊVÃO

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Acknowledgments

The completion of this report could not have been possible without the help and support from several people. First and foremost, I would like to appreciate and thank my Professors and Supervisors Professor Joanna Santiago and Professor João Estevão, who made this report possible. Through each step of the writing process, their direction and counsel supported me, enabling me to reflect on the subject and organize my ideas critically.

Secondly, I would like to express my gratitude to the people I've worked with at Novobanco, who encouraged me at every success and helped me when I needed it, but also to for supporting my professional development and assisting me to reach my complete potential.

Last but not least, I want to thank my family and friends, particularly my parents, who have always supported throughout my academic journey.

Resumo

Os principais objetivos desta investigação são, em primeiro lugar, compreender como a gestão do risco de crédito, medida pelo rácio de *Non-performing loans (NPL)*, afeta a rentabilidade dos cinco maiores bancos comerciais portugueses. Em segundo lugar, compreender que indicador de rentabilidade, *Return on Assets (ROA)* , ou *Return on Equity (ROE)*, é mais adequadamente explicado pelo modelo de regressão escolhido e, finalmente, explorar a diferença na política de gestão do risco entre a Novobanco, que foi alvo de um plano de reestruturação pela Comissão Europeia, e o resto do grupo do banco.

A informação é recolhida a partir da base de dados Orbis, PorData e dos relatórios anuais do banco de 2006 a 2021. A metodologia diz respeito a três modelos de regressão OLS para explorar a diferença na política de gestão do risco de crédito entre Novobanco e o resto do grupo do banco.

A investigação mostra que a rentabilidade do grupo de bancos é negativamente afetada pelo rácio *NPL* no modelo (1) e (2) e que as variáveis emergiram como sendo estatisticamente significativas, exceto para o GGDP. Foi possível concluir que o ROA é melhor explicado pelas variáveis escolhidas e, os resultados do modelo (3) revelaram que não havia uma diferença significativa entre Novobanco e os outros bancos do grupo.

Os resultados do estudo revelaram que, no caso de Portugal, o rácio entre empréstimos e depósitos, o rácio de Adequação de Capital, a Eficiência Operacional e a dimensão do Banco têm um efeito significativo na rentabilidade do banco. O crescimento do PIB não tem qualquer relação com o sucesso do banco.

Palavras-Chave: *NPL*, Rentabilidade líquida dos ativos, Retorno sobre o património.

Abstract

This research main objectives are, firstly, to understand how credit risk management, measured by the non-performing loan ratio, affects profitability in the top five Portuguese commercial banks. In second place, understand which profitability indicator, ROA, or ROE, is more adequately explained by the chosen regression model and finally, explore the difference in the risk management strategy between Novobanco, which was a target of a restructuring plan by the European Commission, and the rest of bank's group.

The information is gathered from the database Orbis, PorData and the bank's annual reports from 2006 to 2021. The methodology used is panel data, concerns three OLS regression models to explore the difference in the credit risk management policy between Novobanco and the rest of the bank's group.

The research shows that the group of banks' profitability is negatively impacted by the NPL ratio in model (1) and (2) and that the variables emerged to be statistically significant except for the GGDP. It was possible to conclude that ROA is better explained by the chosen variables and, the results of model (3) revealed that there wasn't a significant difference between Novobanco and the other banks of the group.

The study's outcomes revealed that in the instance of Portugal, the ratio of loans to deposits, Capital Adequacy ratio, Operational Efficiency and Bank size have a significant effect on the bank's profitability. The GDP growth has no bearing on the success of the bank.

Keywords: Non-performing loans, Profitability, Return on Assets, Return on Equity

Abbreviations

BANKSIZE: Size of the Bank

BCP: Banco Comercial Português

BdP: Bank of Portugal

BES: Banco Espírito Santo

BOPO: ratio between Operational Cost and Operating Income

BPI: Banco Português do Investimento

CAR: Capital Adequacy Ratio

CER: Cost Efficiency Ratio

CGD: Caixa Geral de Depósitos

dBank: Dummy variable

EAD: Exposure at Default

EBA: European Bank Authority

EBA: European Banking Authority

EC: European Commission

ECB: European Central Bank

ESCB: European System of Central Banks

EU: European Union

FinTech: Financial technology startups

FIRB: Foundation Internal Rating Based

GDP: Gross Domestic Product

GGDP: Growth of the Gross Domestic Product

IRB: Internal Rating Based

LDR: Loans to Deposit Ratio

LGD: Loss given default

M: Effective Maturity

NIM: Net Interest Margin

NPL: Non – performing loans

NPLR: Non- performing loans ratio

OPE: Operational Efficiency ratio

PALOP: Países Africanos de Língua Oficial Portuguesa

PIGS: Portugal, Italy, Greece, and Spain

PD: Probability of default

ROA: Return on Assets

ROE: Return on Equity

SDG: Sustainable Development Goals

UL: Unexpected Loss

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Chapter 1 - Introduction

The 2008 global financial crisis made credit risk management in banks more crucial. The management of the risk associated with credit has an impact on commercial bank's profitability because it is one of their primary forms of income.

To help the Portuguese bankers to prevent and control the amount of bad debt in Portuguese banks and assure the health of the Portuguese banking sector, a study concerning the NPL negative impact on the Top 5 Portuguese commercial bank's profitability is going to be conducted. To further deepen the knowledge of bankers, it's also going to be analyzed which indicator is more adequate to measure the effect of NPLs on profitability. Finally, and to satisfy the curiosity of the Portuguese people (if interested on the case), it will also occur a second analyzes to verify if there is a difference in the risk management policy between Novobanco and the rest of the group due to the restructuring plan.

Also, studying this topic falls into the Sustainable Development Goal (SDG) number 8: Decent work and economic growth. Incorporating this study in the scope of SDG 8 is adequate because if banks are healthy and help their clients battle default, it only contributes to economic growth and more financial stability to families.

This study opens a door to further research, such as, to the effect of NPLs on other Portuguese banks and other European banks. Besides the solutions to help control the NPL ratio, like, using the tools of digital transformation and Fintech's to implement them. These solutions are hiring a Digital Chief officer that specializes only in developing the digital components of the bank, continuingly increasing the source of profits. And, in the case of Fintech's, these companies are helpful because, with their superior access to technology, they can contact the clients in default more rapidly, lowering the recovery cost, which controls the levels of NPLs and increases the profits.

Chapter 2 – Literature Review

In this chapter, it is intended to give a closer look at the history of credit risk behind the non-performing loans, the subject of profit, and the implications that the variables non-performing loans ratio, growth of the Gross domestic product, Bank size, Operational efficiency, Capital Adequacy ratio, and Loans to deposits ratio have on the profit of a commercial bank, in the period of 2006 to 2021. This period was chosen because it catches the severe and prolonged recession of 2008 that affected a wide portion of the euro area and decreased borrowers' ability to pay back their loans which had a substantial impact on the rapid increase in NPL ratios. Additionally, is the time portion of the fall out of BES and the birth of Novobanco.

2.1 Basel I and II

To understand why the relationship between non-performing loans and profitability is relevant, it is necessary to understand the origin of the non-performing loans. The international control concerning risk and then, consequently, the NPL ratio, started with the release of the Basel regulations, as an attempt to serve as a platform for frequent interaction between its member countries on banking supervisory issues and to improve the quality of banking supervision globally in order to increase financial stability (BIS)[1].

The Basel laws have undergone three adjustments to date, known as Basel I (1988), Basel II (2004), and Basel III (2010). These agreements outline the primary goals of bank capital, a way to gauge the level of risk associated with bank assets, the regulations governing the minimum capital that a credit institution must hold, as well as procedures for risk coverage and analysis, supervision, and market discipline (Shakdwipee & Mehta, 2017).

Basel I

The 1988 Accord specifically took credit risk into account. A minimum of 8% of risk-adjusted assets must be held in total capital by G10 international banks, with at least 50% of this amount coming from tier 1 capital (equity capital and reported reserves). Hybrid

[1] Retrieved from https://www.bis.org/bcbs/history.htm

debt capital instruments are one type of instrument that could be included in Tier 2 capital. The total of the risk-adjusted assets on and off the balance sheet was referred to as risk-adjusted assets. Assets that were on the balance sheet were divided into four risk buckets (0%, 20%, 50%, and 100%) and then weighted according to the weight of the bucket. Off-balance sheet contingent contracts that are traded over the counter, such as letters of credit, loan commitments, and derivative instruments, have to first be converted to a credit equivalent before being multiplied by the appropriate risk weight (Santos, 2000).

Basel II

Critics said that in order to evaluate a bank's genuine risk potential, more information was required than merely capital ratios. In addition, Basel I completely disregarded the necessity for a strong risk management process while concentrating on important financial risk measures. Basel II, a set of regulations designed to handle the post-1988 financial environment, was developed in 2004 by the international Basel Committee on Bank Supervision in response to this as a signal for Basel I to adapt as well (Shakdwipee & Mehta, 2017).

For this thesis, the important matter of the Basel II are the three different ways to implement credit risk assessment: The standard approach (Standardized approach) is similar to the Basel I proposal, but it employs different shares and allows for the use of financial instruments to lower capital needs and limit credit risk capital. The methodology-based internal ratings (Foundation Internal Rating Based - IRB approach) permit a bank to use their own rating system, including their own calculations on the likelihood of entering into insolvency, but the losses recorded when the counterparty enters into insolvency are provided by the supervisory institution. And, at last, the enhanced internal rating-based methodology (enhanced IRB approach), which allows banks to determine their capital requirements using their models with supervisory approval (Shakdwipee & Mehta, 2017). These approaches influence the calculation of the non-performing loans as it will be seen forward in this chapter.

Differences between Basel I and Basel II

The Basel II Accord adds new elements to Basel I, such as the extending of the risk weights range, the diversification of credit risk mitigation tools through the use of derivative financial instruments (credit default swaps, total return swaps, credit linked notes), the use of client ratings and internally developed models for calculating expected

loss value given risk profile. This method thus emphasizes the fact that, while credit risk is the one that can have the most serious effects on banking activity, it is not the only significant risk. As a result, the risk of losses due to changes in exchange rates, interest rates, or due to technical or human errors should be commensurate, and the capital must be sufficient and based on these risks (Shakdwipee & Mehta, 2017).

2.2 Bank of Portugal

As a replacement for direct and indirect state oversight, the Bank of Portugal (BdP) plays a regulatory role, one that is crucial for the quantitative component of credit, particularly for bank liquidity and solvency, as well as for the future destination of credit and its priorities (Amaral, 2016).

In general, the Statute of the BdP outlines its authority over financial supervision functions that, despite being included into EU law, are not covered by the responsibilities of the European System of Central Banks (ESCB) and the European Central Bank (ECB) (Amaral, 2016).

Altogether, prudential supervision attempts to guarantee that banking activity is properly supervised, overseeing, and correcting the actions taken by banking institutions while also making recommendations to eliminate abnormalities in those actions (Amaral, 2016).

The ECB produced Guidelines on Non-Performing Loans Addressed to Credit Institutions in 2017 with the goal of lowering NPLs on credit institutions' balance sheets due to the high levels of non-performing loans recorded by eurozone countries. Due to this, one of the primary causes of economic stagnation has been identified as having too many NPLs in bank asset portfolios (Mendanha, 2021).

In light of the aforementioned, NPLs have drawn significant attention and concern from banks as well as the regulator in recent years due to the detrimental consequences they have on financial institutions' balance sheets and, subsequently, the economy. The European Banking Authority (EBA) produced the EBA/GL/2018/06 guidelines on the management of non-performing risks and restructured exposures in 2018 to address this issue which then, were adopted by the BdP as Instruction No. 20/2019 in (2019) (Mendanha, 2021).

2.3 Bank's Profitability

The ideas and factors that determine profitability are those that are widely discussed in studies and literature on traditional banking. The internal and external variables were separated into two major categories as profitability determinants (Alshatti, 2016). The management-controllable elements that comprise the internal determinants are issues such as liquidity, investment in securities, investment in subsidiaries, loans, non-performing loans, and overhead costs. Savings, current account deposits, fixed deposits, total capital, capital reserves, and money supply are additional factors that significantly impact profitability (Devinaga, 2010). Like internal determinants, external determinants include variables like interest rates, inflation rates, market growth, and market share that are beyond the management of these institutions' control (Devinaga, 2010).

The concepts "profit" and "ability" are combined to form the compound word "profitability". Each word has a distinct meaning that relates to the primary meaning. "Profit", by conventional economic meaning, is the entrepreneur's compensation for his capacity for productivity (Chase, 1920). The term "ability" relates to an investment's earning potential or, in other cases, its operational success. The meaning of the composed words can be used to deduce the definition of profitability, which is the capacity to generate a return on investment. In other words, the ability of the entity to produce revenues that outpace costs can likewise be used to define profitability (Tulsian, 2014).

For many years, the prime priority for banking operations was thought to be profitability. There is a vast body of research that examines how crucial resource management is in determining profitability because it has attracted substantial attention from specialists even in recent years (Doa et al., 2020). The difference between total revenues and entire costs over an extended period could be referred to as profit (Doa et al., 2020). There is consensus across the board regarding what profit can be defined as, aside from a basic definition. According to the agreement, profit is defined as a balance or excess of price over production expenses (Doa et al., 2020). The definition, however, has not shown itself to be extremely helpful because it does not explain how profits are generated. The definition of concepts like price, costs, expenses, and others that fall under the term profit is still up for debate. Profit must always as the remaining sum on the income statement (Doa et al., 2020).

Differences in bank management objectives, policies, decisions, and actions have an impact on management effects, which are then reflected in variations in bank operating results, namely profitability (Staikouras & Wood, 2004).

2.3.2 Bank profitability indicators

Among the large set of performance measures for banks used by academics and practitioners alike, a distinction can be made between traditional, economic, and market-based measures of performance (ECB, 2010).

The three best metrics to measure profitability in the banking sector, according to Goudreau and Whitehead (1989) and Uchendu (1995), are Returns on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM).

1. ROE

The ROE is calculated by dividing the company's annual net income by the equity of its shareholders (Jensen Investment Management, 2022). In essence, ROE represents the earnings derived from equity. The rising ROE may be a sign that the company is becoming more profitable without raising additional funds. A continually increasing ROE also means that shareholders are receiving a greater return on their investment each year. Overall, the company and the shareholders benefit from higher ROE (Jensen Investment Management, 2022).

$$Return\ on\ Equity(RoE)\ = \frac{Net\ Income}{Shareholders\ Equity}$$

In the study conducted by the European Central Bank (2010), the analysis highlights ROE's initial drawback—that it is not risk-sensitive. Decomposing ROE reveals that a risk component represented by leverage can significantly increase ROE. On the other hand, the ROE figure does not include other risk factors (e.g., the proportion of risky assets and the solvency situation). As a result, ROE is not a stand-alone performance indicator, and decomposition or additional information is required to pinpoint the cause of changes and potential distortions over time. ROE is a short-term indicator and must be interpreted as a snapshot of the current health of institutions. It does not consider either

the institution's long-term strategy or the long-term damage caused by the crisis. When under pressure and in an unpredictable environment, its flaws become much more visible (ECB, 2010).

2. ROA

The best indicator of bank profitability, in the opinion of many regulators, is ROA (Hassan and Bashir, 2003). According to Rivard and Thomas (1997), ROA is the best indicator of bank profitability because it is unaffected by high equity multipliers and provides a more accurate picture of the company's capacity to earn returns on its asset portfolio. The ROA reveals how well management uses its assets to produce profits. ROA is expressed as a percentage and is calculated by dividing a company's annual earnings by its total assets (Olalekan & Adeyinka, 2013).

$$Return\ on\ Assets(RoA)\ = \frac{Net\ Income}{Total\ Assets}$$

ROA is an indication of the operational efficiency of the bank (Petersen & Schoeman, 2008). For a publicly traded company, ROA will be highly influenced by the sector and can differ dramatically. Considering this, comparing ROA to the prior ROA of the same or a related company is the best approach to using ROA as a comparative parameter. The assets of the firm are made up of both debt and equity, and both kinds of assets are utilized to finance the activities of the organization. Investors can determine whether a company is successfully converting its assets into net income by looking at the ROA ratio. Higher ROA indicates higher performance because it demonstrates that the business is generating more revenue with lower spending (Doa et al., 2020). Due to its adjustment for the leverage effect, ROA is typically seen as a more trustworthy profitability measure than ROE in terms of efficiency performance (ECB, 2010).

3. NIM

The ratio of net interest income to average earning assets (assets that generate interest) is known as the Net Interest Margin or NIM. In comparison to ROA or ROE, this measure is less frequently included in reports and statistics (Saksonov, 2014). It does, however,

effectively sum up how effective banks' interest-bearing assets are. The bank manages its interest-bearing assets more successfully the higher the net interest margin (Saksonov, 2014).

$$Net\ Interest\ Margin(NIM)\ = \frac{Net\ \ interest\ Income}{Total\ Assets}$$

The assumption that this variable serves as a barometer of the health and stability of financial institutions. Particularly since the start of the global fiscal crisis, challenges in generating stable levels of profitability, primarily because of the fragile margins from the banks' traditional business, have exacerbated the vulnerability of the European banking system. It's necessary to account for the effects of regulatory and institutional frameworks in addition to the primary bank-level drivers of the net interest margin, such as market power, capitalization, interest risk, and level of efficiency. (Angori et al., 2019).

The high NIM is a barrier to investment in an economy and may reduce the growth variety, according to numerous research (Obeid and Adeinat, 2017). Low interest rates on deposits and high-interest rates on loans may cause borrowers to be less inclined to save money and increase the cost of borrowing, which would reduce their desire to invest in the future. A low NIM cannot be considered a reliable indicator, though. The NIM rate appears in fewer studies than the other two profitability measures because of this complexity. Nevertheless, studies by Martinho et al. (2017); Obeid and Adeinat (2017) showed that NIM is still a reliable determinant of profitability (Doa et al., 2020).

2.3.3 Non-performing loans

Definition of Non-performing loans (NPLs)

"A bank loan is considered non-performing when more than 90 days pass without the borrower paying the agreed installments or interest. Non-performing loans are also called "bad debt"."[2] In other words, when a client doesn't make a single installment on a bank

[2] Retrieved from ECB (2016) in section: Why are NPLs an issue for banks?

loan for more than 90 days, the loan is deemed non-performing. Non-performing debt is another name for bad debt.

According to the ECB (2016) non-performing loans are an issue due to the following explanation: a loan that is earning interest will give a bank the money it needs to turn a profit and create new loans. The bank is required to reserve additional capital under the presumption that the loan will not be repaid when customers fail to adhere to their agreed-upon repayment schedules for 90 days or more. As a result, it is less able to make fresh loans. To continue to turn a profit from giving new loans to consumers, banks must maintain the number of subprime loans to a minimum. A bank's profitability would suffer if it had an excessive number of subprime loans on its balance sheet since it will not be able to generate enough revenue from the credit business. Additionally, it will have to set aside money as a backup in case it ever needs to write off the full amount of the loan (ECB, 2016).

Non-performing loans measuring method

Commercial banks are permitted to assess and compute credit risks using the F-IRB methodology under Basel II (Basel committee on banking supervision, 2019). The internal ratings-based (IRB) approach to credit risk is discussed in this chapter. Banks that have acquired supervisory authorization to utilize the IRB approach may rely on their own internal estimates of risk components in calculating the capital needed for a specific exposure, subject to certain minimum conditions and disclosure requirements (Basel committee on banking supervision, 2019). Table I shows the risk components:

Table I: Risk components used to compute the non-performing loans

Probability of default (PD)	- the likelihood over a specified period, usually one year, that a borrower will not be able to make scheduled repayments.
Loss given default (LGD)	- the estimated amount of money a bank or other financial institution loses when a borrower defaults on a loan. LGD is depicted as a percentage of total exposure at the time of default or a single dollar value of the potential loss.
Exposure at default (EAD)	- the total value a bank is exposed to when a loan defaults. Using the internal ratings-based (IRB) approach, financial institutions calculate their risk.

Effective maturity (M)	- the maturity, which is set at 2.5 years according to the basic IRB, cannot exceed 5 years

Source: Investopedia

For one or more of the risk components, banks may occasionally be compelled to employ a supervisory value rather than an internal estimate (Basel Committee on Banking Supervision, 2019).

Banks must adhere to two key aspects of the agreement to measure NPL: Finding the value of the risky assets is the first step. The second step is that the risk components are described according to the asset class (Basel committee on banking supervision, 2019). Finally, the prerequisites for a bank's adoption of the IRB method at the asset class level are designated, along with the associated roll-out requirements. Except where a 0% risk weight applies under the standardized approach, the risk weight for those other exposures is 100% when an IRB treatment is not specified, and the resulting risk-weighted assets are taken to represent solely unexpected loss (UL). Additionally, banks are required to use the standardized approach's risk weights for the exposures mentioned in those paragraphs (i.e., investments that are evaluated in comparison to specific materiality standards) (Basel Committee on Banking Supervision, 2019).

Effects of non-performing loans on bank profitability

Due to the possibility of regulatory measures, the relationship between non-performing loans and profitability has been a focus of banking studies. After reviewing some earlier studies, it can be said that NPLs may have a detrimental effect on profitability, or in other words, render banks ineffective (Demirgüç-Kunt and Huizinga, 1999). According to Hippolyte (2005), macroeconomic stability and economic growth are linked to lowering levels of non-performing loans, while unfavorable macroeconomic conditions are linked to expanding NPL scope.

So, according to Demirgüç-Kunt and Huizinga (1999), Hippolyte (2005), Hosna et al. (2009), and Doa et al. (2020), NPLs have a negative relationship with bank profitability.

While trying to find literature on the effects of non-performing loans on bank profitability, it was observed that most research papers were from East Asian Countries, more specifically countries that went through economic stress. Countries like Nepal,

Vietnam, Indonesia, and others on the following studies: The effect of capital adequacy ratio, net interest margin and non-performing loans on bank profitability: The Case of Indonesia by Silaban (2017); Effect of non-performing loan on the profitability of commercial banks in Nepal by Bhattarai (2017); The effect of non-performing loans on profitability of commercial banks: Case of Vietnam by Doa et al., (2020).

However, there have not been many studies that have examined the NPL market in the south of Europe and the Portuguese Market. Since the European market has a different organization, culture and politics, a study about how NPLs impact the European commercial banks is greatly beneficial to understand to reasons for the NPL crises and to prevent them from happening again. A study concerning the NPL impact on Portuguese commercial bank's profitability is going to be the research gap of this thesis because is desired to help the Portuguese people and specially bankers to prevent and control the amount of bad debt in Portuguese banks and assure the health of the Portuguese banking sector.

The euro area's NPL ratio reached a peak of about 8% in 2014, up from about 3% at the start of the global fiscal crisis in late 2008 (Huljak et al., 2020). The severe and prolonged recession that affected a wide portion of the euro area and decreased borrowers' ability to pay back their loans was a major factor in the sharp rise in NPL ratios. At the same time, other issues, such as bank lending and monitoring practices and their limited ability to resolve defaulted loans, had a substantial impact on the rapid increase in NPL ratios. At the end of 2017, the NPL ratio was below 5% in nations like Austria, Belgium, Estonia, France, Lithuania, and the Netherlands, while it was still above 10% in the euro area nations that had been most impacted by the recent economic and fiscal crisis, namely Cyprus, Greece, Ireland, Italy, and Portugal (Huljak et al., 2020).

At the moment, the Portuguese NPL ratio is at 3,4 %[3]. Which is below the 5% European Banking Authority (EBA) benchmark. The goal of a 5% gross NPL ratio is to ensure a minimal level of transparency and that lending institutions are ready to stop the accumulation of non-performing exposures and act quickly to address the problem. The justification for using an NPL criterion is that loans make up most non-performing exposures on credit institutions' balance sheets; as a result, a calculation based on the

[3]Retrieved from https://bpstat.bportugal.pt/serie/12504544

share of NPLs more accurately reflects the general evolution of asset quality and is risk-based (European Banking Authority, 2018).

But first, let's show some evidence that in fact, this relationship is already proven to be true for other banks (Adhikary, 2006; Bernanke et al.,1991; Barr and Siems,1994; Berger and DeYoung,1997; Demirguc-Kunt,1989; Whalen,1991).

Non-performing loans and bank profitability negative relationship

In economies with bank-based financial systems, sometimes known as the "credit crunch", non-performing loans or lower asset quality may delay economic recovery by reducing operational profit margins or eroding capital bases for new loans (Bernanke et al., 1991). To Klein (2013) non-performing loans will affect the profitability of banks which is their main profit source and financial stability of the economy. Bankruptcies and economic slowdown may result from low asset quality or significant amounts of non-performing loans (Adhikary, 2006; Barr and Siems,1994; Berger and DeYoung,1997; Demirguc-Kunt,1989; Whalen,1991). Since lower quality assets, also known as toxic assets, are one of the key causes of the 2008 global financial crisis, quantifying non-performing loans, thoroughly examining their consequences, and developing the necessary economic policies are crucial for both the overall economy and the banks (Kadioglu et al., 2017).

Hosna, et al. (2009), used a panel data set over the period of 2000-2008 for 4 Sweden commercial banks to conduct the research. The outcome implied there is an effect of credit risk management on the profitability on a reasonable level with a 25,1% possibility of NPL and Capital Adequacy Ratio (CAR) in predicting the variance in ROE.

Silaban (2017) studied the effect of CAR, NIM, and NPL for 40 private banks in the period of 2009-2013 and conclude that non-performing loans have a negative effect on bank profitability. Due to the increased number of problematic loans this abnormal circumstance results in for the bank, the amount of profit made decreases as more banks are affected.

Vinh (2016) also studied the impact of non-performing loans on bank profitability and lending behavior. This study examines how non-performing loans affect bank profitability and lending practices using a sample of 34 Vietnamese commercial banks. The empirical results, which combine the dynamic panel data approach with the System GMM estimate, offer some support for the idea that NPLs have a detrimental impact on

bank profitability and lending practices, the NPL correlation coefficient is recorded to -0.321% with the ROA variable. Thus, profitability and lending operations are decreased as a result of the decline in asset quality. It has been discovered that banks work less hard to improve loan proposals when NPL numbers are higher. High-capitalized banks also exhibit stronger profitability and loan expansion, according to the research. Finally, this author suggests that the regulator should apply closer screening and monitoring of the risk of loan default to maximize profits. Because of this evidence, the NPL is the most important variable for the model.

Therefore, the research question is set:

Do NPLs have a negative impact in the bank's profitability? Then, for further investigation the author is going to set two hypotheses:

H1: How does it explain ROA or ROE in Portuguese Banks?

H2: Does Novobanco have a different credit risk management strategy compared with the other banks?

To understand the variables that explain the ROA and ROE, let's see what the literature on the subject shows for each chosen variable.

Firstly, the NPL ratio. This ratio poses a major danger to not just the overall national monetary security system but also the financial stability of commercial banks. Commercial banks will have significant capital losses when bad loans rise above the permissible threshold of 5% (European Banking Authority, 2018). This has an impact on cash flows, and banks will become less liquid, perhaps putting their profitability and long-term viability in jeopardy. Because of the dangers that can result in significant financial losses, bad debt reduces profits (Doa et al., 2020). The primary source of income for the bank is credit, which is its primary operation. Lending risks, however, came with the revenue from credit activity. The unpaid debt (capital, interest, and fees) reduces the capital of commercial banks, making it more difficult for them to meet their obligations to gain money. Athanasoglou et al., (2008), Berger and DeYoung (1997), and Demirgüç-Kunt and Huizinga (1999), all identified a negative association between the bad debt ratio and the profitability of commercial banks. The profitability of the bank will decline as the NPL ratio rises.

In second, Abreu and Mendes (2002) acknowledged that the loans to deposits ratio and bank profitability had a statistically significant and favorable link. The bank may be able to create more income if it can provide more loans. Furthermore, deposits, the least expensive source of funding, are the primary source of money for these loans. According to Agustiningrum's (2013) research, LDR has a favorable and considerable impact on profitability. Unlike the findings by Ayadi and Boujelbene (2012), concluded that LDR had a negative and significant impact on ROA profitability.

Thirdly, the Capital Adequacy Ratio. For many stakeholders, including the central banks, bankers' associations, governments, and other financial authorities, as well as bank managers, understanding how capital adequacy affects the profitability of the financial industry is crucial (Hosna et al., 2009). Numerous studies indicate that banks with more capital outperform their less capitalized competitors. According to Staikouras and Wood (2004), there is a direct correlation between EU bank profitability and equity levels. Additionally, tracing a favorable effect of ownership level on profitability is indicated by Abreu and Mendes (2002). The previous discovery of a favorable association between capital/asset ratio and bank earnings is supported by Goddard et al. (2004).

The operational efficiency ratio (OPE) proxy, also known as ratio between Operational Cost and Operating Income (BOPO) and Cost Efficiency Ratio (CER), will be used to quantify operating efficiency in this study based on the findings of a review of prior research. Operating income and operational costs are the two major posts in the actual income statement (Christaria and Kurnia, 2016). Operational expenses are the expenses incurred to carry out operational activities. If operating revenue is the result of operational operations. The bank is deemed inefficient in carrying out its operational activities if the operational costs are high, yet the operating income is quite modest. On the other hand, because operating costs are a subtraction component in the calculation of net profit, high operational costs will limit the amount that may be realized (Prihatna et al., 2021).

Since the cost is lower, a smaller OPE shows that the bank is more effective in managing its commercial operations. The bank will be able to use its assets to create more profit as a result, which will result in a rise in ROA. A bank is healthy if its OPE ratio is less than 100% and vice versa (Christaria and Kurnia ,2016).

About the Gross Domestic Product (GDP) growth rate, as can be predicted, the demand for credit by families and businesses, as well as provisions, are strongly correlated with bank profitability and Gross Domestic Product growth. When bank profitability is measured in terms of ROA, inflation has an impact, suggesting that management anticipates inflation expectations and changes interest rates to increase profits (Trujillo-Ponce, 2013). Tanna et al., (2005) conducted a study and discovered a link between ROA and macroeconomic factors. They discovered a strong and favorable correlation between bank profitability and GDP. Similar findings are reported in the study of Sufian and Chong (2008) as well. Other research, such as those by Hassan and Bashir (2003), Tanna et al. (2005), Kosmidou et al. (2006), and Pasiouras and Kosmidou (2007), also revealed a significant and favorable link between GDP and profitability. All these studies, which focus on both internal and external factors that affect profitability, yield consistent findings about economic growth and how it affects banking sector profitability.

Regarding the Bank size, according to Ramlall (2009), there is a positive relationship between bank size and profitability. Because of economies of scale, larger banks are more profitable than smaller ones. Luo (2003), Hannan and Prager (2009) observe that smaller banks can produce higher profit since they have lower expenses and better performance efficiency, in contrary to Kosmidou (2008) who claims that large banks' sizes may have a detrimental impact on bank profitability. At the same time, Sayilgan and Yildirim (2009) claim that a rise in interest rates and a rise in the number of borrowers causes a drop in bank liquidity.

At last, the dummy variable dBank. In August 2014, Novobanco was created following the resolution measure applied to Banco Espírito Santo (BES) by the Bank of Portugal (BdP). On 31 March 2017, the BdP announced the selection of Lone Star for the completion of the sale process. In October 2017, the European Commission (EC) approved, under European Union (EU) state aid rules, the Portuguese aid for the sale of Novobanco. Days later, the sale of 75% of Novobanco to Lone Star took place, ending the bank's status as a transition bank and appointing new governing bodies[4]. Since then, Novobanco has been trying to keep up with the restructuring plan and following the rules

[4] Retrieved from Novobanco website: https://www.novobanco.pt/institucional/o-novobanco/quem-somos. Accessed at 15-02-2023.

to become a trustworthy bank to the Portuguese consumers and companies. So, the author wants to analyze if there is a significant difference in the credit risk management strategy between Novobanco and the rest of the group considered. Since Novobanco had the biggest NPL ratio in 2017, compared with the other banks, and in 2021, decreasing to a ratio of 5,7%, the author is expecting to see a negative and significant difference.

Chapter 3 – Methodology and Data

3.1 Research design

To respond to the research question, this study is conducted utilizing a deductive technique. Furthermore, the hypotheses presented are also based on other studies and hypotheses in this field.

This research is quantitative in nature. Panel data gathered is analyzed using a regression model. It performs the analyses and responds to the research question using the regression outputs.

To analyze the research question and hypotheses, the study used a descriptive approach and examined the period from 2006 to 2021, which is when the world faced a fiscal crisis and when Banco Espírito Santo was dissolved and Novobanco was born and integrated into the restructuring process from the European Commission. The non-performing loans were also stated to have been high and unabated during this time, lasting till this day.

The study focusses on the top five Portuguese commercial banks: Caixa Geral de Depósitos (CGD), Millenium BCP, Banco Português do Investimento (BPI), Santander Totta, and Novobanco, and it's given a special attention on the bank with the most repercussions: Novobanco. The data was retrieved from the database Orbis from 2006 to 2021. As a result, the regression analysis includes a total of 80 observations.

3.1.2 Data Collection

The Database Orbis, Pordata and Financial annual reports served as the study's data source. The data on the GGDP was collected from the PorData- Estatística sobre Portugal e a Europa. Other information needed for the variables ROA, ROE, LDR, NPLR, CAR, Bank size and OPE was gathered from Orbis between the referred period.

For more accurate information, Table II shows the correspondent variable from the indicators on the database:

Table II: Variable's data retrieved from the database Orbis

ROA	Return on Average Assets (%)
ROE	Return on Average Equity (%)
CAR	Total Capital Adequacy Ratio
Bank size	Total Assets
Operating Efficiency	Operating Expenses / Operating Income
NPL ratio	NPL ratio (as reported)
LDR	Loans to Deposits ratio & Borrowings

Source: author's elaboration

Finally, to have a more complete database, several information gaps were filled using data from annual reports of which bank and, in the case of the NPL ratio, the author used the average of the year before and after to proxy the data that was missing.

3.2 Research Model

In this study, three OLS regression models will be analyzed: Model (1) - which analyzes if the independent variables - NPLR, OPE, LDR, CAR, BANKSIZE and GGDP explain the profitability measure ROA; Model (2) which investigates if the same variables are more adequate to explain the indicator ROE; And, in model (3) is added a new variable, a dummy variable (dBank) to model (1) to explore the difference in the credit risk management policy between Novobanco and the rest of the bank's group. Then, using Stata, the regression outputs are obtained.

Based on the theoretical relationship among variables and after researching various regression models while observing their conclusions, the models that best describes the relationship between NPL and profitability for the different purposes of this analyzes are:

$$ROA = \alpha + \beta_1 NPL_{it} + \beta_2 LDR_{it} + \beta_3 CAR_{it} + \beta_4 GGDP_{it} + \beta_5 BANKSIZE_{it} + \beta_6 OPE_{it} + e_{it} \quad (1)$$

$$ROE = \alpha + \beta_1 NPL_{it} + \beta_2 LDR_{it} + \beta_3 CAR_{it} + \beta_4 GGDP_{it} + \beta_5 BANKSIZE_{it} + \beta_6 OPE_{it} + e_{it} \quad (2)$$

$$ROA = \alpha + \beta_1 NPL_{it} + \beta_2 LDR_{it} + \beta_3 CAR_{it} + \beta_4 GGDP_{it} + \beta_5 BANKSIZE_{it} + \beta_6 OPE_{it} + \beta_7 dBank_{it} + e_{it} \quad (3)$$

For the testing models, the credit risk associated with the loans, Capital Adequacy Ratio will be considered as the Gross Domestic Product growth rate to capture the country/market component in this study. Also, introducing another variable: Operating efficiency, which measures the relationship between the Operating Expenses and Operating income since it has a direct impact on the profitability indicators ROA and ROE.

Furthermore, the bank size will be included in the model to comprehend whether the volume of assets the bank processes will have an impact on its profitability, as total assets reflection of the bank's size. Finally, NPL ratio and loans to deposit ratio will also be considered in this model, which are the most consensual variables among the authors. For model (3) it was included a dummy variable- dBank to analyze if there is a difference

between Novobanco and the other banks in terms of risk management strategies. In Table III it's possible to observe in detail all the information regarding each variable and the authors that support the variable in the matter of literature review.

Table III: Summary of variables in the research models

Description		Acronym	Measurement	Authors
Dependent Variables				
Bank's profitability	Return on Assets	ROA	$\frac{Net\ Income}{Total\ Assets}$	Hassan and Bashir (2003), Rivard and Thomas (1997), Doa et al (2020)
Bank's profitability	Return on Equity	ROE	$\frac{Net\ Income}{Shareholders\ Equity}$	Saksonov (2014), Hosna et al (2009)
Independent Variables				
Non-performing loan ratio		NPL	$\frac{Non-performing\ loans}{Total\ Loans}$	Athanasoglou et al. (2008), Berger and DeYoung (1997), and Demirgüç-Kunt and Huizinga (1999), Doa et al (2020)
Loans to deposits ratio		LDR	$\frac{Total\ Loans}{Total\ Deposits}$	Mendes and Abreu (2002), Agustiningrum (2013), and Ayadi and Boujelbene (2012), Hutagalung et al. (2013).
Total Capital Adequacy Ratio		CAR	$\frac{Tier\ 1\ Capital + Tier\ 2\ Capital}{Risk\ Weighted\ Assets}$	Staikouras and Wood (2004), Goddard et al. (2004), Hosna et al (2009)
Operational Efficiency		OPE	$\frac{Operational\ Expenses}{Operating\ Income}$	Christaria and Kurnia (2016), Buchory (2015), Prihatna (2021)
GDP growth rate	Gross Domestic Produt	GGDP	$\frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$	Sufian and Chong (2008), Hassan and Bashir (2003), Tanna et al. (2005), Kosmidou et al. (2006), and Pasiouras and Kosmidou (2007)
Bank size		BANKSIZE	Total Assets	Ramlall (2009), Luo (2003), Hannan, and Prager (2009), Kosmidou (2008), Sayilgan and Yildirim (2009)
Dummy Variable		dBank	1= "Novobanco" 0= "The other Banks"	

Source: author's elaboration

Finally, Table IV holds information on the expected sign of the coefficient standard of each independent variable.

Table IV: Summary of the expected sign of the coefficient standard of each independent variable

Independent Variables	Expected Sign
OPE	+/-
CAR	+/-
NPL ratio	-
BANKSIZE	+/-
LDR	+/-
GGDP	+/-
dBank	+/-

Source: author's elaboration

Chapter 4 - Results and Discussion

4.1 Descriptive statistics and correlation between variables

The descriptive statistics results, in Table V show that the commercial bank's profitability measured by ROA have the mean of 0.18% and the fluctuation of the remaining values around the mean is 0.010. The highest level of profitability is 1.60% and the lowest is negative -2.99 %. The bank with the lowest level of profitability is Novobanco in 2020 with the ROA of -2,99% and the bank with the highest level of profitability with ROA of 1.60% is BPI in 2018. In terms of bank's profitability measured by ROE, the bank with the lowest level of profitability is also Novobanco in 2020 with the ROE of -37.47% and the bank with the highest level of profitability with ROE of 23.28% is BPI in 2012.

Table V: Description of the variables

Variable	Obs	Mean	Std. dev.	Min	Max
ROA	76	.0017925	.0097964	-.0298666	.0160318
ROE	76	.0307081	.1392879	-.3746867	.2328382
NPLratio	63	.057139	.0524323	.0078	.305
CAR	78	.1284538	.0383667	0	.29
LDR	80	.6716893	.2517869	0	.9340124
BANKSIZE	78	6.50e+07	3.05e+07	1963475	1.26e+08
GGDP	80	.0045125	.0331125	-.083	.0548
OPE	73	.6279817	.2195284	.0007122	1.596395

Source: Author's elaboration

The mean OPE of 5 commercial banks is 62,80%, in which, the bank with the highest OPE of 159,64% Novobanco in 2020. The bank with the lowest OPE of 0.07% was Banco Espírito Santo in 2011. The mean of CAR of 5 commercial banks is 12.85%, in which, the bank with the highest CAR of 29.00% Santander Totta in 2021. The bank with the lowest CAR of 5.72% was Caixa Geral de Depósitos in 2016.

The ratio of NPLs to total average debt of 5 commercial banks is 5.71%, in which, the bank with the highest NPLs ratio was Novobanco in 2017 with the significantly high NPLs ratio of 30.5%. The bank with the lowest NPLs rate of 0.78% was Santander Totta in 2008. The mean of LDR of 5 commercial banks is 67.17%, in which, the bank with the

highest LDR of 93.40% BPI in 2006. The bank with the lowest LDR of 56.68% was CGD in 2021. The bank size, which is measured by total assets, has the mean value of 64.98. The bank which has the smallest size with the value of 1,9 was Santader Totta in 2011. On the other hand, the largest bank with the value of 125,76 was CGD in 2011. The average growth rate of GDP in the period of 2006 - 2021 is 4.51%, in which the highest growth rate is 5.48% achieved in 2021 the lowest GDP growth rate is -8,30% in 2020.

The correlation between the variables in the model is shown through the correlation coefficient matrix in Table VI.

Table VI: Correlation Matrix of the model variables

	ROA	ROE	NPLratio	BANKSIZE	LDR	CAR	OPE	GGDP
ROA	1							
ROE	0.9625*	1						
NPLratio	-0.7392*	-0.6589	1					
BANKSIZE	-0.1417	-0.2045	-0.0145	1				
LDR	0.0326	0.0209	-0.1046	-0.0841	1			
CAR	0.1134	0.0743	-0.1418	0.0574	0.1605	1		
OPE	-0.6575*	-0.6414*	0.3725*	-0.0441	0.3081*	-0.0201	1	
GGDP	0.1413	0.1504	0.0513	-0.0557	0.0908	-0.0126	-0.0765	1

Note: This table presents the Pearson correlations of the variables used in the study. $p < 0.1$*, $p < 0.05$ **, $p < 0.01$***

Source: Author's Elaboration

Correlation coefficient measures the degree of linear relationship between two variables regardless of the dependence of variables. Based on the regression results, the correlation coefficients of the independent variables are majorly lower than 60%, which means that these independent variables have low correlations (Doa et al., 2020).

High intercorrelations between two or more independent factors in a multiple regression model are referred to as multicollinearity. When a researcher or analyst tries to figure out how well each independent variable can be used to predict or comprehend the dependent variable in a statistical model, multicollinearity can result in skewed or misleading findings (Wooldridge, 2006). When the VIF index is greater than 5, there is a high degree of multicollinearity among variables (Meng et al., 2017). Results in Table VII show VIF less than 5, which means there is no linearity among the independent variables. Therefore, these variables can be used for regression analysis.

Table VII: Multicollinearity table

Variable	VIF	1/VIF
OPE	1.33	0.750798
NPLratio	1.30	0.768494
LDR	1.10	0.907764
CAR	1.04	0.962609
GGDP	1.04	0.964214
BANKSIZE	1.02	0.981386
Mean VIF	1.14	

Source: Author's Elaboration

Finally, a final test to check if the model was fit in all the angles: The heteroskedasticity test. This test evaluates if the standard deviations of the independent variables are non-constant. The result of the F test for model (1) (2) (0,1588; 0,2407), as it can be seen in Table VIII, showed that the null hypothesis was rejected for a significance level of 5%. Which means that the standard deviations are constant and could proceed with testing the models.

Table VIII: Heteroskedasticity test for Model (1) and (2)

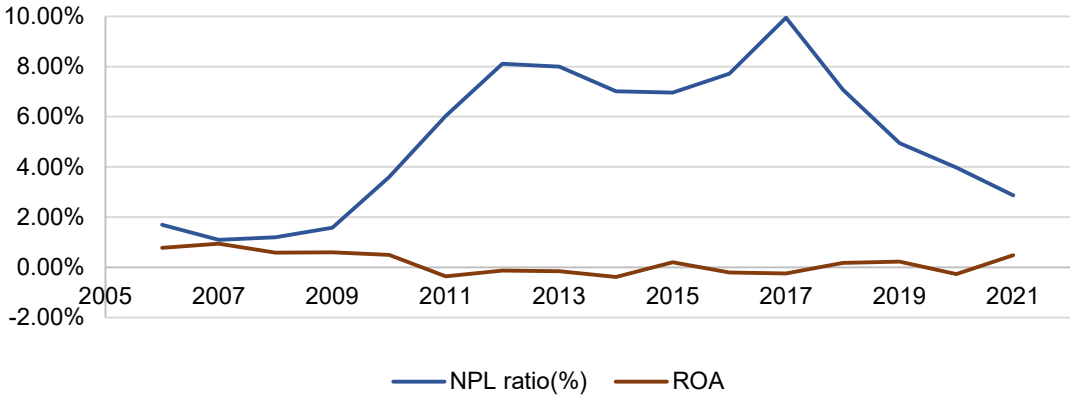
Model (1)	**Model (2)**
estat hettest, rhs fstat Breusch-Pagan/Cook-weisberg test for heteroskedasticity Assumption: i.i.d. errors terms	estat hettest, rhs fstat Breusch-Pagan/Cook-weisberg test for heteroskedasticity Assumption: i.i.d. errors terms
H0: Constant variance	H0: Constant variance
F(6,51) = 0,88 Prob > F = 0,5188	F(6,51) = 1.38 Prob > F = 0,2407

Source: Author's Elaboration

From here forward, the author shows a descriptive information of each variable, starting with the non-performing loans ratio:

When contemplating the evolution of the average NPL ratio on the period of 2006 to 2021 of the five Banks compared with the average ROA in Graphic 1, it is quickly spotted the negative connection of the NPL ratio and the ROA.

Graphic 1: Average bank's ROA and NPL ratio from 2006 to 2021

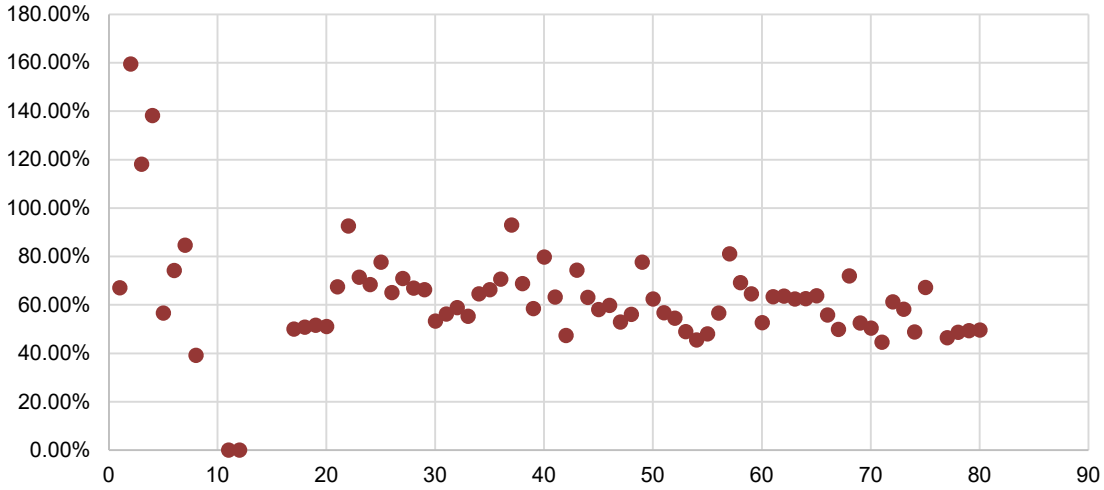


Source: Author´s elaboration

Since the peak of bad debt in 2017, banks have been rigorously trying to reach the 5% goal of the ECB. For example, Novobanco reached an NPL ratio of 30,50% in 2017 and in 2021 was only 0,7% behind the goal. Consequently, this result has an impact in the ROA and in 2021, Novobanco reached for the first time in years a positive indicator.

About the Loans to Deposit ratio, based on Graphic 2, all the listed banks maintained their LDR below 100%. But if once crosses that threshold, banks are exposed to real risk. Due to the high perceived benefit, some banks are still inclined to gamble the risk. In order to boost their profits and prevent a disruption to the liquidity pool, some banks only keep an LDR below 100% and gradually raise it. As an illustration, the Santander Totta gradually grew from 65,78% in 2014 to 86,70% in 2016. Between 2009 and 2012, Millennium Bcp reduced its LDR from 90,53% to 78,22% its ROA dropped from 0,26% to -1,24% as a consequence. Following that, the bank delayed its LDR rate, and the ROA gradually increased.

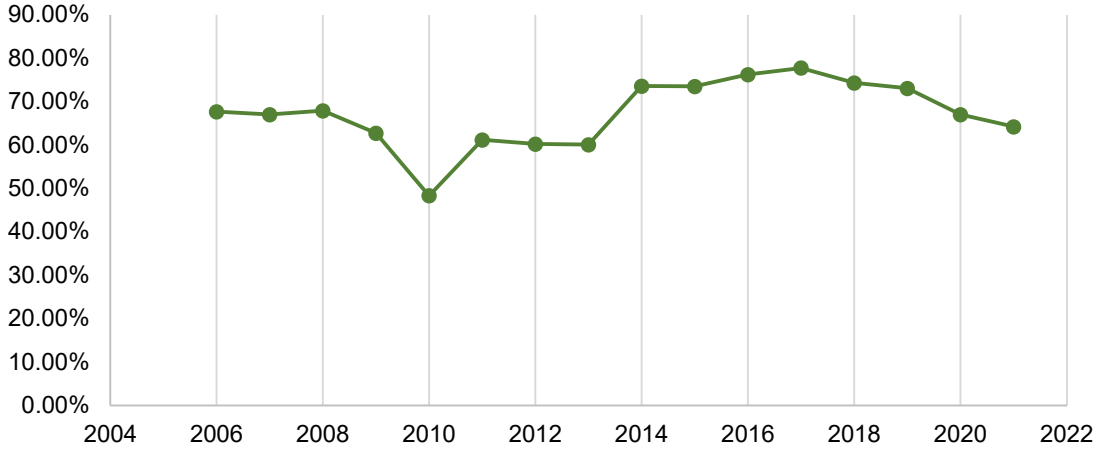
Graphic 2: Plot of the average Loan to Deposit ratio



Source: Author´s elaboration

In respect to the Operational Efficiency, a bank is considered to be healthy if its OPE ratio is less than 100%. As can be seen from Graphic 3, most listed banks kept the OPE less than 100%, but when it occurs, it is noticeable on the ROA: Novobanco increased its OPE slowly from 56,68% in 2017 to 159,64% in 2017, as hence the ROA decreased from -2,68% to 2,99%.

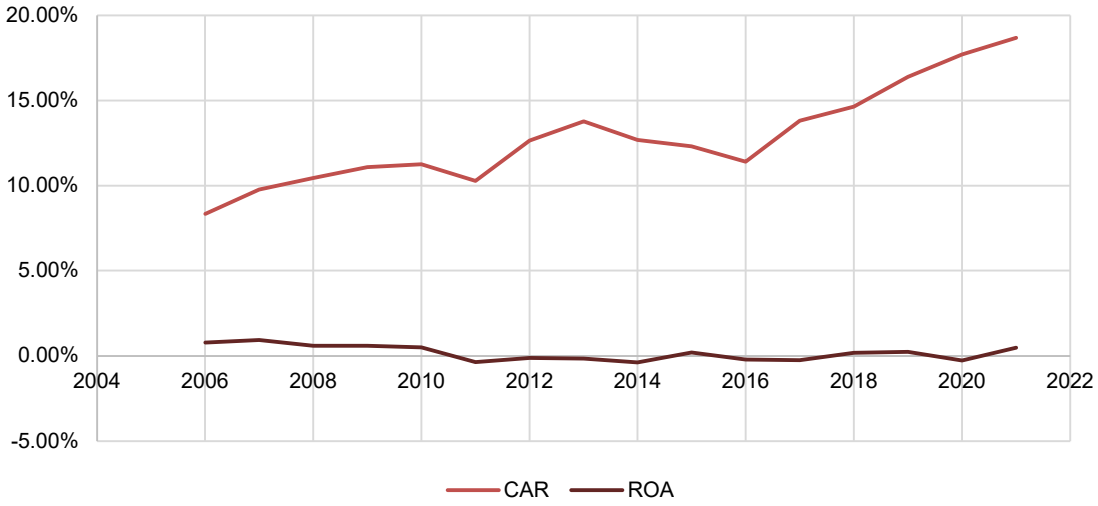
Graphic 3: Frequency of the Operational Efficiency ratio



Source: Author´s elaboration

Concerning the Capital Adequacy Ratio, as can be seen in Graphic 4, the average bank's during the period of 2006 until 2021 presented a Capital Adequacy Ratio over 8,2%[5] . It is also obvious that the five Portuguese banks didn't obey to the maximum standard of 14,9%[6]. but the ROA, as expected, increased as the CAR increased.

Graphic 4: Plot of the average CAR and ROA



Source: Author's Elaboration

[5]Retrieved fromhttps://www.eib.org/attachments/publications/eib_group_risk_management_disclosure_report_2021_en.pdf , accessed on 12-02-2022.

[6]Retrieved from https://www.bankingsupervision.europa.eu/press/pr/date/2022/html/ssm.pr220210~6455538b07.en.html, accessed on 12-02-2022.

4.2 Regression Results

Using Stata 17 software with data of 80 observations (n = 80), unbalanced data, from 5 subjected banks across the period from 2006 to 2021, the results from OLS regression models (1) and (2) are shown in Tables IX and X as follows:

Table IX: Estimated results using OLS regression for model (1)

ROA	Coefficient Std.	err.	t	P>t [95%	conf. interval
NPLratio	-0.0963798	0.0117572	-8.2	0.000	-0.1927595
CAR	0.036754	0.0149097	2.47	0.017	.0068215 .0666865
OPE	-0.0248235	0.0028213	-8.8	0.000	-0.0496469
BANKSIZE	-7.25E-11	1.94E-11	-3.73	0.000	-1.445E-10
LDR	0.016893	0.0046801	3.61	0.001	.0074973 .0262887
GGDP	0.0301924	0.0155398	1.94	0.058	-.001005 .0613897
_cons	0.0096325	0.0046887	2.05	0.045	.0002196 .0190455
Number of Banks	5				
R-Squared	0.8591				

Source: Author's Elaboration

According to Table IX, the estimation of OLS regression for model (1) shows that NPLR, CAR, LDR, BANK SIZE, and OPE have a statistically significant effect on the profitability (ROA) of the commercial banks at 5% significance. The GGDP revealed to have a positive impact on profitability, on the opposite side, the BANKSIZE and OPE turned out to have a negative impact on the profitability indicator ROA. Finally, the only variable that is shown not to be statistically significant is the GGDP with a p-value greater than 5%

Table X: Estimated results OLS regression for model (2)

ROE	Coefficient Std.	err.	t	P>t	[95% conf. interval]
NPLratio	-1.111541	0.2019197	5.5	0.000	-2.2230827
CAR	0.4430516	0.2560605	1.73	0.09	-.0710113 .9571144
OPE	-0.3639951	0.0484528	7.51	0.000	-0.7279902
BANKSIZE	-1.51E-09	3.33E-10	4.53	0.000	-3.021E-09
LDR	0.2239479	0.0803767	2.79	0.007	.0625849 .3853109
GGDP	0.4065387	0.2668808	1.52	0.134	-.1292468 .9423242
_cons	0.1859813	0.080524	2.31	0.025	.0243227 .34764
Number of Banks	5				
R-Squared	0.7914				

Source: Author's Elaboration

Conferring to Table X, the estimation of OLS regression for model (2) shows almost the same results as referred previously with the ROA model, with the exception of CAR revealing not statistically significant with a p-value greater than 5%.

Taking a step forward on this investigation, now, it presented the case of Novobanco. It is pretend to analyze if the bank that received the restructuring program from the EC: Novo banco, had a credit risk management strategy statistically significant and different from the other banks. For this, was created a dummy variable- dBank (1 when Company_ID= "Novobanco"; 0 when Company_ID refers to the other banks). Then, performed an OLS regression for model (1) with the new variable – dBank, becoming model (3).

Table XI: Estimated results using OLS regression for model (3)

ROA	Coefficient Std.	err.	t	P>t	[95% conf. interval]
OPE	-0.0227329	0.003233	-7.03	0.000	-0.04547
NPLratio	-0.0832298	0.015462	-5.38	0.000	-0.16646
BANKSIZE	-8.32E-11	2.10E-11	-3.96	0.000	-1.7E-10
CAR	0.0313621	0.015383	2.04	0.047	.0004654 .0622587
LDR	0.009122	0.007581	1.2	0.235	-.0061051 .0243491
GGDP	0.0345972	0.015805	2.19	0.033	.0028512 .0663431
dBank	-0.0045682	0.00352	-1.3	0.2	-.0116388 .0025024
_cons	0.0152825	0.006376	2.4	0.02	.0024767 .0280884
Number of Banks	5				
R-squared	0.8637				

Source: Author's Elaboration

In agreement with Table XI, all the variables are statistically significant with the exception of dBank and LDR. This result shows that H2 is not rejected. Which means that the difference between Novobanco and the other banks in terms of the effects on profitability isn't statistically significant and so, there is no difference in the credit risk strategy.

4.3 Discussion of Results

The regression coefficient of variables when estimated by the OLS model are consistent with the sign's expectation. The GGDP was not statistically significant, so it will not be discussed further. Regarding the significant variables, let's take a deeper look to the results, starting with the non-performing loans ratio:

The ratio has a negative and statistically significant regression coefficient for NPL and is -0.0963798 (1) and -1.111541 (2), showing that the bad debt ratio has a negative effect on total debt to ROA and ROE. The NPLs will decline as this percentage rises, and the profitability of the bank will rise as well. This outcome is in line with the study model's hypothesis. As a result, the capacity of Portuguese commercial banks to turn a profit will decline as the rate of NPLs rises. Additionally, this is in line with studies conducted in other nations by Doa et al., (2020) and Hosna et al., (2009).

After the fiscal crisis of 2007–2009, the NPLs ratio in not only Portugal but also the entire globe was steadily increasing. The banks experienced difficulties with the NPLs rate, which slowed rehabilitation. Delays in debt settlement frequently prevent future credit approvals, which results in another round of defaulting on debt. This puts the borrower in a precarious position and may increase the bank's NPL rate. For example, Novobanco increased its NPLs rate from 1,95% in 2010 to 6,59% in 2012 and continued to do so in 2013 to hit 9,44%. As a result, Novobanco saw no profit in the years that followed. Another issue is that banks can only give so many loans because of the high NPL rate, which forces banks to make larger loan loss provisions. As it was previously referred, LDR and profitability are favorably correlated, so restricting lending resources will have an impact on profitability. Furthermore, as the results showed, the OPE is negatively correlated to profitability: if banks don't control their expenses lower than their income it will have a negative impact on profitability and also on the credit risk strategy.

The outcome also indicates that, to maximize their capacity for profit-making, Portuguese commercial banks should continue to devote greater focus to evaluating and tracking the loan default risk.

Moving on to Loans to Deposit Ratio, it is observed that the positive and statistically significant regression coefficient LRD is 0.0169 for model (1), and for model (2) 0.2239. It shows that the greater the loans to deposits ratio, the more profitable Portuguese commercial banks are, which is consistent with the findings of Abreu and Mendes' studies

(2002). A bank's primary means of making money is by raising lending rates while lowering deposit rates for clients. In general, commercial banks use this to increase the number of loans they can provide. As long as the banks keep the loans below the deposit amount, commercial banks do not experience a lot of liquidity risk.

Regarding the operational efficiency, the regression coefficients registered -0.0248 (1) and -0.3640 (2) which are negative and statistically significant, indicating the negative impact of higher operational costs on the ROA. When this ratio increases, a larger OPE shows that the bank is not effective in managing its commercial operations. Since collecting and distributing money to third parties is the bank's primary function as an intermediary, interest costs and yields account for most of the the bank's expenses and operating revenue. The decline in pre-tax profits, which eventually lowers profitability (ROA) in the concerned bank, will be impacted by an increase in operating expenses, which concurs with the conclusions of Christaria and Kurnia (2016), and Dendawijaya (2003).

The capital Adequacy Ratio regression coefficients are 0.037 (1) and 0.4431 (2), which are positive and statistically significant, proving that higher capital requirement contributes positively to banks' profitability, which is consistent with the studies result from Abreu and Mendes (2002) and Staikouras & Wood (2004).

A bank's condition may be improved if the CAR ratio is high, and a high CAR value indicates that the bank can afford to fund its activities. According to a report of the European Investment Bank group in 2021, the Institution CET1 overall capital requirement is 8.2% [7] and overall capital requirements and guidance increase marginally to stand at 14.9%[8].

Finally, the Banksize, observed regression coefficients of -7.25E-11 (1), -1.51E-09 (2), which is adverse and numerically significant and shows the size of the bank has an opposing effect, especially on the ROA. Since the bank size is measured with the total

[7]Retrieved from https://www.eib.org/attachments/publications/eib_group_risk_management_disclosure_report_2021_en.pdf , accessed on 12-02-2022.

[8]Retrieved from https://www.bankingsupervision.europa.eu/press/pr/date/2022/html/ssm.pr220210~6455538b07.en.html, accessed on 12-02-2022.

amount of assets, the ROA is mathematically correlated. When the amount of total assets increases, the Net Income is divided by a bigger number, obtaining a smaller ROA percentage. This result goes according to the research of Kosmidou (2008), who claims that large banks' sizes may have a detrimental impact on bank profitability. This is due to a rise in interest rates and a rise in the number of borrowers causing a drop in bank liquidity.

4.3.1 ROA vs ROE

When observing the estimated results, it was noticeable that model (1), measured by ROA, obtained the best result in explaining the dependent variable. In other words, the independent variables chosen for the model were more fitted to explain the Return on assets, with an R-squared of 86%. Since ROE is not risk-sensitive and is a short-term indicator and must be interpreted as a snapshot of the current health of institutions. It does not consider either the institution's long-term strategy or the long-term damage caused by the crisis. When under pressure and in an unpredictable environment, its flaws become much more visible (ECB, 2010).

4.3.2 The Novobanco Case

Regarding the Novobanco case and behold the model (3) with the dummy variable, the NPL ratio had a negative and significant impact on the revenue but, the dummy variable was not significant. The interpretation towards this result is that the consequences of the restructuring program didn't make a change in the credit risk management policy comparing to the rest of the banks group. But if the restructuring program did not take place the results could be the opposite. This is a clear limitation to the results and should be taken in consideration.

Nonetheless, there were concrete signs of relevant improvement. Concerning the NPL ratio, in 2017 the ratio was 30,5%, just over 4 years, the ratio was only 0,7% to reach the 5 % goal advised by the ECB. This result only shows that the efforts regarding the bad debt were paying off and will only improve in the future.

Chapter 5- Conclusion, Limitations and Further Research

5.1 Main Conclusions

The test findings have demonstrated that as the percentage of non-performing loans rises, the bank's ROA will fall, lowering bank profitability. So, the research question is responded and proven: NPLs have a negative and significant impact on the Portuguese commercial banks chosen for the study. The study's outcomes revealed that in the instance of Portugal, the ratio of loans to deposits, Capital Adequacy ratio, Operational Efficiency and Bank size have a significant effect on the bank's profitability. The GDP growth has no bearing on the success of the bank. The estimated results are in line with the points made by the following authors, Athansoglou et al., (2008); Abreu and Mendes (2002); Christaria and Kurnia, (2016); Hosna et al., (2009) and Kosmidou (2008).

Additionally, when observing the data evolution through the period of 2006 to 2021, is concluded that the data gathered followed the international and national events, such as the 2008 global crises and the succeeding years of recovery. Also, in 2020 and 2021 the recession provoked by Covid-19 was reflected on the variables.

To finalize, it was concluded that model (1), measured by ROA, obtained the best result in explaining the dependent variable when compared to the ROE. In other words, the independent variables chosen for the model are more fitted to explain the Return on assets, with an R-squared of 86% in comparison to an R-squared of 79% of model (2). And, regarding the Novobanco case and model (3) with the dummy variable, the NPL ratio had a negative and significant impact on the revenue but, the dummy variable wasn't significant which means that there is no difference between Novobanco and the other commercial banks of the sample.

5.2 Limitations and Further Research

During the estimation of the results, several limitations were encountered, like missing data on the files of the database and unbalanced data, which tempered the results of the analyses. Also, the fact that the group subject is only contemplated by the 5 major banks in Portugal might deviate the result because the analysis sample doesn't include all the banks in Portugal. Finally, the result of model (3) and the indifference in the risk

management policies between Novobanco and the other banks might be explained because of the restructuring plan. If Novobanco had not received the restructuring plan the result could have been the opposite.

To conclude, this research opened a door to further research. Regarding the challenges of the Banking sector in the 21st century, about the Digital Transformation challenge, there are some points to consider in the present future of bank management: Digital transformation is an ongoing and constant phenomenon in the lives of students, bankers, politicians etc. Each month comes out a new product, a new algorithm or software that can radically change the world and the way it usually works. The latest and most spoken is the ChatGPT. This is a clear example of how companies and banks must master technology and take advantage of it, so they continue to be productive, effective and don't lose market share. In terms of bank management, the clear path to battle the ongoing digital transformation is to have a Digital Chief officer that specializes only in developing the digital components of the bank such as, their website, mobile app, access to information, creation of new product to attract new clients, and others. Hence, battling the challenge is the approach to continuingly contribute to the crescent success and increasing profit of the bank. Also, this challenge applies to Portuguese banks but not only, and as mentioned before, this might influence the performance of banks so, new studies will be necessary to verify this digital transformation challenge on bank's profitability.

Now, considering a second challenge: Fintech's exponential presence in the financial market, the only recommendation and solution that the author sees to the challenge is to take advantage of these tech companies. These companies can help banks to control the amount of non-performing loans, to reduce costs in the recovery processes by recruiting these companies to rapidly go through all the clients in default instead of having teams of employees doing the work. They can serve as consultants to implement new systems in the bank and centralize the information for easier access and consultation. And, in this fashion it becomes the solution and not a threat, contributing to the increase of the bank's ROA. Further research on this challenge falls, as aforementioned is to investigate if the effects of incorporating FinTech in the bank's processes have a positive effect on the profits. Finally, another study that would be interesting to explore is replicating the research question to other countries like Portugal, Italy, Greece and Spain (PIGS) and compared them to the north of Europe and for bank's from PALOP - País Africanos de

Língua Oficial Portuguesa countries, since they are inspired by Portuguese banks, to try to understand their differences.

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