The New Normal: How the Negative Interest Rates Policy Affected Portuguese Banks' Profitability

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Abstract

This Dissertation analyzes how the Negative Interest Rate Policy (NIRP) adopted by the European Central Bank (ECB) affected the profitability of Portuguese banks. We use publicly available data for 36 Portuguese Banks available on the Portuguese Bank Association (APB – Associação Portuguesa de Bancos) for 2010-2017, covering the period before and after the introduction of the policy. The present Dissertation employs a Multiple Regression analysis, using Net Interest Margin (NIM) as the main measure of Banks' performance. This research's findings suggest that banks with higher excess liquidity are more affected by the NIRP since the policy works as a tax on excess liquidity hoarding. Moreover, Portuguese banks are not able to pass the negative interest rates into the depositors but they seem to be able overcome the constraint on deposit rates. Finally, our results do not show any clear relationship between NIM and the change in the level of short-term rates nor the change in slope of the yield curve.

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Resumo

Esta dissertação analisa a forma como a Política de Taxas de Juros Negativas (NIRP) adotada pelo Banco Central Europeu (BCE) afetou a rentabilidade dos bancos portugueses. São utilizados dados publicamente disponíveis para 36 bancos portugueses facultados através da Associação Portuguesa de Bancos (APB) para os anos 2010-2017, cobrindo o período antes e depois da introdução da política. A presente dissertação emprega uma análise de regressão múltipla, usando a Margem Líquida (NIM) como a principal medida de desempenho dos Bancos. As conclusões desta pesquisa sugerem que os bancos com maior excesso de liquidez são mais afetados pela NIRP, isto porque a política funciona como um imposto sobre o excesso de liquidez. Além disso, os bancos Portugueses não podem passar as taxas de juro negativas para os depositantes, contudo, parecem ser capazes de superar esta restrição nas taxas de juro de depósito. Finalmente, os nossos resultados não mostram nenhuma relação clara entre a NIM e a alteração do nível das taxas de juro de curto prazo, nem na mudança da inclinação da curva da taxa de juros.

Título: O Novo Normal: Como a Política de Taxas de Juros Negativas Afetou a Rentabilidade dos Bancos Portugueses

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Palavras-chave: Portugal, taxas de juro negativas, rentabilidade bancária, bancos centrais

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1 Introduction

"*The zero lower bound isn't a theory, it's a fact*"[1]

Until recently, economists around the world believed that the nominal interest rates couldn't go into the negative territory. Who would lend their money to receive less - in nominal terms - the day after? This is the logic behind the Zero Lower Bound.

Following the 2008 financial crisis several central banks engaged in a new set of policy measures. On June 5, 2014, the Governing Council of the European Central Bank (ECB) decided to lower the deposit facility rate (DFR), for the first time to below zero, following other central banks such as Danmarks Nationalbank (DNB), Swiss National Bank (SNB) and the Swedish Riksbank (SR). This decision was taken with the aim of promoting bank lending, fighting low inflation and stimulating economic growth.

This unprecedented rout of implementing negative interest rates policy (NIRP) raised considerable questions about the potential undesirable side effects on both the economy and banking system (Scheiber, Silgoner, & Stern, 2016). A consensus of opinion is yet to be reached on the effects of nominal interest rates on profitability, empirically and theoretically (Bernoth & Haas, 2018). Such consensus is even harder under negative rates territory, although the arguments point to more adverse effects. The banking system plays a crucial role in the economy and assures its sustainability by generating adequate profits. This reveals the usefulness of studying the relationship between interest rates and bank profitability. Profitable banks contribute to financial soundness and, consequently, to financial stability (Altavilla, Boucinha, & Peydró, 2018).

The main aim of this Dissertation is to explore how the NIRP affected the profitability of the Portuguese financial system. The Portuguese financial sector's landscape has some particularities; it suffered several losses, interventions and readjustments in the recent years. Moreover, it's highly concentrated, the 5 major Portuguese banks hold 76% of all assets (APB values for the year 2017). The second objective of the Dissertation is to increase the literature about Portuguese banking sector. To our best knowledge there are not papers that study the direct impact of the negative interest rates on the Portuguese Banking system. This Dissertation also aims to be distinguished from other related studies since the data analysis

[1] *Paul Krugman, wrote in 2013*
See Five On The Floor. (2013). Retrieved 16 July 2019, from https://krugman.blogs.nytimes.com/2013/10/15/five-on-the-floor

goes beyond other sources which normally only includes the most significant institutions in the Portuguese banking system. Lastly, the relative recentness of this topic caused it to be mainly unstudied. For this reason, this research was steered to a purpose of adding to the understanding of the monetary transmission mechanism under NIRP and its potential impacts on financial stability.

The Dissertation uses a Multiple Regression analysis to study how negative interest rates could affect the profitability of Portuguese banks. The data used in this Dissertation was mainly taken from the public data available on the Portuguese Bank Association (APB – Associação Portuguesa de Bancos) that reunites the banks' balance sheets and income statements of over 90% of the assets in Portugal's banking system. The time window used was 2010 to 2017 (14 semesters), covering the period before and after the introduction of the policy. The period under analysis was especially eventful, embodying the global financial crisis, the euro sovereign debt crisis and the Economic and Financial Assistance Programme to Portugal (Álvaro Pina & Campos, 2019). This poses significant challenges to the analysis and to the correct identification of the effects of NIRP. To study bank's profitability Net Interest Margin (NIM) is used as the main measure of Banks' performance.

A part of banks' deposit base, retail deposits does not reprice fully when policy rates are cut to a level below zero, due to the fact that retail deposits are floored at zero while most other rates paid adjust to the policy. Also, the negative interest rate is applied directly on the Deposit Facility Rate (DFR) on the excess of the reserves requirements. Therefore, we investigate if banks with higher level of Deposit Ratios and Excess Liquidity are more affected by this policy.

Our analysis provided some evidence for the side-effects of NIRP on the Portuguese banking stability. The analysis yields the following main results. First, Portuguese banks seem to be able to overcome the constraint on deposit rates. Second, banks with higher levels of excess liquidity seem to be more affected by NIRP. Additionally, the results indicated no clear relationship between the Net Interest Margin and change in the level of short term rates (3-month Euribor) or the change in slope of the yield curve in the time frame analyzed, before or after the introduction of NIRP. When we split the Net Interest Margin into Interest Income Margin and Interest Expense Margin, we find that after the introduction of NIRP lowering the interest rate is associated with lowering both of these components - this means that although there is a decrease in Interest Income Margin it is followed by a decrease in the Interest

Expense Margin.

Overall, the impact of NIRP in the Portuguese Banking System seems to have been contained, although we should bear in mind that long periods of negative interest rates could lead to different results.

Following this brief overview about the present Dissertation, the contextualizing chapter, section 2 provides a general overview of the history and evolution of the banking sector in Portugal and includes a theoretical analysis that considers the main channels through which the negative interest rate policy influences bank profitability. Section 3 addresses the relevant literature review. Section 4 focuses on the methodology and data used to compute the regressions. Section 5 presents the Dissertation's empirical findings. This chapter describes the main findings. Finally, section 6 presents the main conclusions with a detailed summary of the topics addressed by this fundamental academic research question.

2 Contextual and Theoretical Background

2.1 Contextual Background

2.1.1 Brief history of the Portuguese banking sector

Following the "Carnation Revolution" of 1974 when Portugal transitioned to a parliamentary democracy, the newly elected government decided in 1975 to nationalize all Portuguese banks and Insurance companies. Only in 1985 as a result of the integration in the European Economic Community (EEC), a period of strong economic liberalization started (Mendes & Rebelo, 1999), "*there were restrictions to banks' activity, credit ceilings, administrative regulation of interest rates and restrictions to the creation of new banks or the expansion of the branching network"* according to Lima & Soares de Pinho (2008, p. 4). This period of reprivatisation and liberalization lasted until 1996 and the previously restrained banking system was promptly transformed (Canhoto & Dermine, 2003) leading to the creation of the single market, made possible by the political commitment of achieving economic and financial integration (Boucinha & Ribeiro, 2007).

The next decade faced a period of broadening competitivity as described by Soares de Pinho (1999). To create competitive advantages and acquire market power banking supply was diversified and new market niches started to be exploited. Mergers and acquisitions also took place (Almeida, 2001), hence the existence of only six commercial banks operating in Portugal at the turn of the century, when the majority of the market share was hold by the three largest banks (Boucinha & Ribeiro, 2008).

In the mid 90's the Eurozone anticipation of participation in the euro favoured Portugal's economy by diminishing country and exchange rate risk (Blanchard & Portugal, 2017). However, low interest rates made credit easy to access, raising debt levels for companies, households, and the government. By 2002, investment and GDP had stagnated, but large current account and headline budget deficits remained, resulting in general government debt reaching 60% of GDP in 2004 (Dias & Marques, 2017).

In 2009 Portugal suffered a 10% decline in exports as a result of the global financial crisis, caused by an output decrease in trading partner countries. This cutback went along with an enlargement in the cost of funds, partly counterposed by the liquidity provided by the ECB (Blanchard & Portugal, 2017).

Two years later, by April 2011, the Portuguese banks and government were shut out from the financial markets on account of the ever-increasing interest rates on long-term Portuguese government bonds, followed by the 2010 euro crisis (Dias & Marques, 2017). In appendix 1, Figure 2, we can observe clearly this moment for the Portuguese government bonds. Portugal was forced to ask for external assistance and a month later, in May 2011, the government and "Troika" (IMF, ECB and EC) signed an agreement that comprised a rescue package summing up to €78 billion with the goal of redirecting Portugal to a stable and uprising economy and a target of 3% deficit of the GDP in 2013 (European Comission, 2011). The money had a predominant purpose of financing the budget, but a part of the package was also used to recapitalise the banks. In return, in 2011 and 2012 Portugal committed to engage in unprecedented fiscal consolidation efforts (Dias & Marques, 2017).

This chain of events composed by the two considerable and unfavourable occurrences described above decayed Portugal's economy.

2.1.2 Recent events in the Portuguese banking sector

Besides the intervention by the "Troika" in 2011, the Portuguese banking sector had a series of events in the recent years. In 2008 the nationalization of Banco Português de Negócios (BPN) - adjudicating it to CGD - was the first state rescue following a criminal investigation into fraud and money laundering. The Financial Assistance Programme (FAP) to the sovereign included the mandatory sale of BPN. The plan did not set a minimum price, but it imposed an accelerated schedule. It was bought in 2011 by Banco BIC for €40 million - only a fraction of the more than 2 billion euros the state spent to recapitalise the bank.

In 2010, the Bank of Portugal ordered the liquidation of the small Banco Privado Português (BPP), following a series of financial crimes and money launderings schemes. Although the Portuguese Government injected an amount of €450 million in 2008 the recovery was seen impossible (OECD, 2017).

Portugal's biggest banking event unfolds in 2014. The second biggest Portuguese bank, Banco Espírito Santo (BES) - classified as a significant credit institution by the European Central Bank - revealed heavy losses of €3.6 billion in the first half of 2014. The scale of the losses came as a surprise and "reflected the practice of management acts seriously detrimental" according to Bank of Portugal. The bank resolution process passed by splitting it into two banks: a new one, called Novo Banco, which kept the company's healthy assets and a so-called "bad bank" with the toxic assets that retained the "Banco Espírito Santo" name (World

Bank, 2016). BESI, the investment bank owned by the same holding of former BES was sold in 2015 to Haitong Securities Co, changing its name to Haitong.

In 2015, the less significant bank (LSI) Banco Internacional do Funchal (Banif), a private bank that had the Portuguese State as its majority shareholder as a consequence of the 2012 capital injections, also benefited from a state intervention, in part similar to BES bailout, since the bank was split into "good" assets that were sold to Santander Totta (€150 million) and the public support covered the future contingencies (€2.26 billion). In the same year 1.4% GDP was added to the budget deficit by BANIF's public support (OECD, 2017).

In 2013, the Commission approved a restructuring aid for Caixa Geral de Depósitos (CGD), the Fully State-owned and the largest bank in Portugal subject to a restructuring plan and commitments that apply until late 2017. Reached 2017, a new recapitalisation was necessary due to "(…) *CGD's inability to recognise and adjust to changing and more challenging market conditions in Portugal, which lasted longer than expected, and the low interest rate environment in Europe more generally"*[2] CGD's received a capital injection of €3.9 billion - 2.0% of Portugal's GDP in 2017.

Portugal left the FAP on 17 May 2014 without the need of any type of precautionary measures. The Portuguese banking system has now 67 banks. However, there are only five major Portuguese banks that hold 76% of the assets in the Portuguese banking sector, provide 80% of the loans and receive 81% of the deposits (APB values for the year 2017) - CGD, Millennium BCP, Novo Banco, Banco Santander Totta and BPI. Banco de Portugal (BdP) is the supervisory and regulatory authority that reports directly to ECB and to the Portuguese Securities Market Commission (CMVM), that supervises and regulates securities and other financial instruments markets as well as the activity of all of those who operate in the market.

[2] See European Commission. (2017). *State aid: Commission finds Portuguese recapitalisation of Caixa Geral de Depósitos involves no new aid*. Retrieved from http://europa.eu/rapid/press-release_IP-17-556_en.htm

2.2 Theoretical Analysis

2.2.1 The Implementation of Negative Interest Rates Policy

The main goal of ECB is to maintain price stability as it is essential for economic growth and job creation. With aim of fighting deflationary tendencies in the Euro Area, the ECB engaged in multiple rounds of unconventional monetary policy (UMP) measures since 2014. Besides a central bank balance sheet expansion, the ECB also brought its policy rate, the conventional instrument, into negative territory. In June 2014 the ECB lower the DFR to -0.10 percent, and since then further cuts followed, bringing the rate to -0.40 percent in March 2016. Negative interest rates were first deployed by Sweden's central bank in July 2009, and were also followed by the central banks of Denmark, Switzerland and Japan. The logic behind this rate cut was to counter persistent low inflation, to push down yields and borrowing costs and to incentivize banks to invest in other assets, boosting their prices (e. g. Cœuré, 2016; Bottero et al.2019). A particular implication of this policy is that banks are charged on excess liquidity and most banks cannot charge negative interest rates to their depositors. Banks might try to adjust the level of excess liquidity to minimize the impact of the policy and these adjustments will define the way the rate cut impacts other interest rates and, therefore, the economy.

2.2.2 Impact in Financial System of the Negative Interest Rates Policy

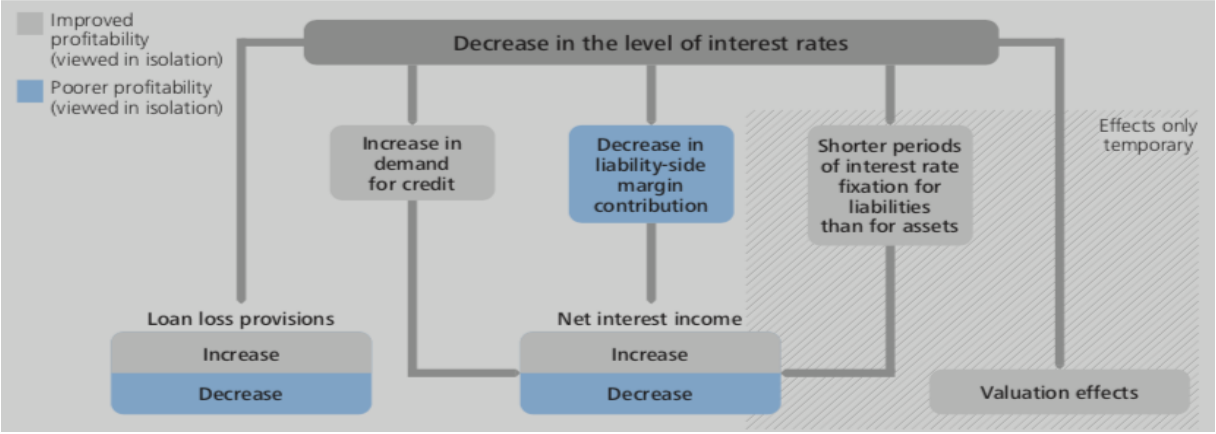
This section focuses on understanding the conceptual mechanisms in which negative interest rates may affect bank's balance sheet and profitability. Understanding how Negative Interest Rates Policy (NIRP) can impact the economy is fundamental in preparing for the next economic downturn (B. Eggerstsson, E. Juelsrud, H. Summers, & Getz Wold, 2019).

Recent literature has explored a wide array of transmission channels through which negative rates may impact profitability. The illustration below shows the effects of a decrease in interest rates on selected components of bank profitability. Weak bank profitability is considered a key risk factor for the euro area banking sector[3]. Low profitability affects the ability of banks to generate capital, making it difficult to build buffers against unexpected shocks and limits their capacity to provide loans. Thus, it is of relevance to understand better the ways NIRP can be transmitted and test them empirically. The main channels of monetary

[3] See European Central Bank (2018). How can euro area banks reach sustainable profitability in the future?. Retrieved 23 July 2019, from https://www.ecb.europa.eu/pub/financial-stability/fsr/special/html/ecb.fsrart201811_1.en.html#toc3

policy transmission are described below, with a focus on how negative rates may affect these channels.

Figure 1: Impact of the decrease in the level of interest rates (Deutsche Bundesbank)



Interest Rate Channel - Cutting policy rates reduces the rates at which banks conduct their borrowing and lending activities (Arteta, Kose, Stocker, & Taskin, 2016). If lower policy rates are expected to continue for a long period of time, it should lead to a flattening of the yield curve, which in turn lowers the spread earned by intermediaries who use short-term liabilities to finance assets in the long run (Borio, Gambacorta, & Hofmann, 2015; Hannoun, 2015; Bernoth & Haas, 2018). This should lower real interest rates and borrowing costs, thus increasing demand for loans by encouraging firms and households to increase spending and investment (Arteta et al., 2016).

In Portugal there is a legal restriction to pass the negative rates to bank customers meaning there is an effective zero lower bound on retail deposits[4]. Even in countries where this is possible, banks seem reluctant to do so, since this could initiate a bank run (Kerbl & Sigmund, 2017) at the same time banks are pressured to lower the lending rates by competitors (Scheiber et al., 2016). This has a direct impact on bank's profitability by narrowing the interest rate margin (e. g. Jobst & Lin, 2016). This is the main transmission channel that will be studied in this Dissertation.

Credit Channel/ Bank Lending Channel – NIRP operates as a tax on excess liquidity hoarding, The negative rate is applied to all parts of banks' current accounts with the

[4]Banco de Portugal Notice 6/2009

Eurosystem in excess of their reserve requirements[5] (Demiralp, Eisenschmidt, & Vlassopoulo, 2019). This policy which should increase the amount of credit available by incentivising banks to give more loans and extend them (Arteta et al., 2016; Demiralp, Eisenschmidt, & Vlassopoulos, 2019). However, Brunnermeier & Koby (2017) argue that below some threshold of the policy rate (the reversal rate), additional reductions could have a contractionary effect on bank lending.

Portfolio Channel - A policy decline in short-term interest rates should support higher valuations of asset prices (Arteta et al., 2016) boosting the non-interest income. Collateral present values are also prompted which, as pointed out by Bernoth & Haas (2018), modifies bank estimates of probabilities of default, loss-given-default and there is a reduction on loan loss provisions (LLP) as borrowers' debt servicing costs are reduced (Borio & Hofmann, 2017).

On a second front, the policy could lead to more risk-taking by banks. In a *"search for yield"* banks are willing to take on more risk (e.g. Cœuré, 2016; Borio & Hofmann, 2017) in an attempt to increase their profit volumes (Brunnermeier & Koby, 2017; Arce, Garcia-Posada, Mayordomo, & Ongena, 2018). This could have a negative impact on their Loan loss provisioning (LLP). LLP policy is critical in assessing financial system stability, since it has a direct impact on the amount of credit banks can supply to the economy. In principle, banks have to estimate an amount to cover a number of factors associated with potential loan losses. Even if the loss doesn't materialize during the designated period banks are unable to use that money to provide credit.

Previous studies have already confirmed that there is a positive relationship between bank profitability and interest rates but the overall effect of NIRP on bank profitability is not obvious. Profitability can increase or decrease due to lower lending rates and funding costs. Banks can adopt different strategies by changing their portfolios, increasing commissions and lending volumes (Altavilla et al., 2017). This outcome shows itself to be rather ambiguous leading to the raise of important questions about this policy's effectiveness and possible unwanted outcomes.

[5] The minimum reserve requirement is calculated as a ratio of the reserve base of the institution. The liabilities included in the reserve base and to which a positive reserve ratio is applied are overnight deposits, deposits with an agreed maturity or a period of notice of up to two years, debt securities issued with a maturity of up to two years, and money market paper. Regulation (EC) No 1745/2003 of the ECB (ECB/2003/9) provides the legal framework

In this Dissertation, we focus on Portugal were banks are mostly commercial banks therefore focus on the activity of borrowing and lending, having therefore high levels of deposits. Most banks and specifically the Portuguese banks cannot apply negative rates to their depositors, instead of bearing this costs it's expected that they adapt the business model and balance the negative impact of the NIRP by increasing for example the commissions. The policy has a direct cost on excess liquidity, since banks must pay on excess of their reserve requirement. Banks could adjust their balance sheet in order to avoid paying for negative interest rate.

3 Past Studies

This Dissertation is related to two broadly defined strands of the literature: i) Bank profitability; ii) the impact of conventional and unconventional monetary policy, in particular of NIRP. The main goal of the present chapter is to analyse the essential academic literature sources associated with these research topics.

Early studies establish a positive relationship between interest rates and bank profitability (Flannery (1981) and Hancock (1985))**.** Demirguc-Kunt & Huizinga (1999) show that high real interest rates are correlated with higher profitability and net interest margins. Saunders & Schumacher (2000) stressed the importance of interest rates for banks' net interest margins.

More recently, Busch & Memmel (2015) study how the level of interest rates affects banks' net interest margin . They conclude that in the medium to long-term horizon an increase in the interest rate level is beneficial to the net interest income and that the recent low-interest rate environment caused banks' interest margins for retail deposits, especially for term deposits to drop more steeply than in the pre-financial crisis period.

The impact of macroeconomic and banking specific factors on banks' profitability was analysed by Albertazzi & Gambacorta (2009). This research led them to understand the close relationship between profits, the type of business and economic cycles as the GDP impacts the net interest margin (lending channel) and loan loss provisions (due to credit quality changes). In the case of Portuguese banks, they have assets with shorter duration. This makes them more prone to be affected by money market interest rates and not so much by longer-term variations of interest rates.

Abreu & Mendes (2001), studied the determinants of banks profitability in Portugal, Spain, France and Germany over the period 1986–99. Less efficient banks assure their profitability by passing on the costs to their customers through either higher interest rates in loans or lower interest rates in deposits. In the case of well-capitalized banks, they manage to have lower funding costs and higher net interest margins.

While these studies are focused on "normal" times, this Dissertation focusses, as other recent papers, on the impact of unconventional monetary policy, in particular of NIRP, on bank profitability.

Brunnermeier & Koby (2017) introduce the concept of the "reversal interest rate" and study its determinants. There is a tipping point, the "reversal interest rate", where lowering the short-term interest rates reduces banks' net interest income and squeezes their profits, which makes an expansionary monetary policy, a contractionary one. The level of the reversal

interest rate is not necessarily zero but can be higher or lower.

Most of the empirical studies analysed the link between low or negative interest rates on a more aggregate level, such as Jobst & Lin (2016) or on individual banks as in Altavilla, Boucinha, & Peydró (2017) that study profitability in a panel of European banks in the period 2000-2016 concluded that the overall impact of the flattening of the yield curve does not have a significant impact on ROA. However, it was found a significant effect of interest rates on net interest income but this is largely offset by the positive impact on loan-loss provisions and non-interest income. In the same lines, Lopez, Rose, & Spiegel (2018) find that when negative nominal interest rates are compared with low positive rates, banks losses in interest income are almost offset by lowering deposit expenses and an increase in non-interest income. Using a data set on 108 large international banks, from Europe and Japan and a smaller sample from the United States, Borio et al. (2015) show that a reduction in both short-term interest rates and yield curve slope depresses ROA. A positive relation between the level of interest rates and bank profitability has been identified by other authors, such as Genay & Podjasek (2014) that argues Interest rate movement do impact profitability but have a generally small effect and that changes in economic conditions matter more.

Similarly to this Dissertation, there is growing literature on the impact of NIRP for a specific country experience**,** Basten & Mariathasan (2018) studied Switzerland using bank-level data and the share of excess reserves at the central bank as a proxy for exposure to negative policy rates. With a difference-in-differences method, they find that Swiss retail bank's profitability has been unaffected by NIRP as banks offset lower-interest margins by increasing fees on loan- and deposit-related services, while they also tend to take more risk. Scheiber et al. (2016) investigate the impact in Denmark, Sweden and Switzerland proving that negative interest rates have so far not resulted in a significant reduction of bank profitability and particularly of net interest income. Focusing on the Austrian banking sector, Kerbl & Sigmund (2017) concluded that NIRP could lead to a decrease in banks' profitability since after breaking through the zero lower bound short-term assets can follow into negative territory while overnight deposits cannot. For the United States banking sector, although it has not reached the negative territory, Bikker & Vervliet (2018) found that bank profitability is reduced at low interest rates by analysing a panel of banks from 2001-2015. They inferred that this decline is primarily caused by lower net interest margins.

Several papers highlight the fact that banks might mitigate the negative effects of falling interest rates by raising lending volumes (Demiralp, Eisenschmidt, & Vlassopoulos, 2019), declining interest expenses (Scheiber et al., 2016), lowering risk provisioning (Altavilla,

Boucinha, & Peydró, 2017), setting higher fees and commissions (Turk, 2016) (Bottero et al., 2019), or taking more risk (Heider, Saidi, & Schepens, 2018). How banks adjust to this policy will ultimately determine the impact on their profitability. Moreover, the impact of the policy is expected to be heterogeneous, depending on each bank portfolio - for example the maturity gap between assets and liabilities (Ampudia and Van den Heuvel, 2017).

One has to acknowledge that identifying the impact of NIRP is difficult because of the simultaneity with other measures such ECB‘s Asset Purchase Programme (APP), as mentioned by Demiralp et al. (2019). This events – NIRP and APP - might compensate for each other as argued by Gros, Blot, Hubert, Demertzis, & B. Wolff (2016).

NIRP is a recent topic and research is still on an early development stage. This topic was shown to be surely challenging as the disparate results show but unquestionably important to be studied for its effectiveness as a policy option and for its interactions with financial stability.

This paper adds to the aforementioned literature by clarifying the impact of NIRP in the Portuguese banks’ performance.

4 Methodology & Variables Construction

4.1 Variables

4.1.1 Dependent Variables

In order to address the research question, it is crucial to define profitability, it can be defined as the degree to which a business or activity yields profits in a set period of time in relation to its dimension. In this study, the main variable used to explain profitability is the Net Interest Margin.

Net interest margin (NIM) is defined as a measure of banking system efficiency (Demirguc-Kunt & Huizinga, 1999), a proxy for the income generation capacity of the traditional banking business - borrowing and lending money. NIM is the ratio between the net interest income, i.e. the difference between interest income and interest expenses, and total assets.

Return on equity (ROE) measures how much profit a company generates with the shareholders' capital (Rossi, Borroni, Lippi, & Piva, 2018). ROE is computed as the ratio between Net Income and the value of Shareholder's Equity.

4.1.2 Explanatory variables

4.1.2.1 Bank-specific variables

Taking into consideration the existing literature on the determinants of bank profitability and in particular the work of Bikker & Vervliet (2018) and Arce et al. (2018), the following control variables are used.

Deposit ratio is computed as deposits to total assets. According to Lopez et al. (2018) and Heider et al. (2018) it is expected that banks that are more dependent on deposits as a source of funds suffer a stronger impact when policy rates turn negative since they are not able to charge their depositors negative rates.

Excess liquidity is calculated as the ratio between reserve holdings in excess of minimum reserve requirements and total assets (Demiralp et al., 2019). To calculate the minimum reserve requirements the demand deposits and term deposits were used according to the legal framework[6]. The negative DFR implies a direct cost on banks excess liquidity, since this rate

[6] The legal framework for the minimum reserve system is set out in the Regulation (EC) No. 1745/2003 of the European Central Bank of 12 September 2003 on the application of minimum reserves (ECB/2003/9)

was applied to banks' liquid holdings in excess of their reserve requirements. Following this logic, we expect the coefficient to decrease after the NIRP.

Size is measured as the logarithm of the bank's total assets. Bigger banks have the opportunity to exploit economies of scale however small banks, may be in a better position to adapt their operations to financial and regulatory changes over the financial cycle. *A priori*, the effect of size in profitability is therefore undetermined (Demirguc-Kunt & Huizinga, 1999; European Central Bank, 2015; Athanasoglou, Brissimis, & Matthaios D., 2004).

Capitalization expresses bank's overall soundness. It's computed as total equity capital over total assets. However, I use a balance sheet capital ratio, instead of the regulatory, which is a weaker measure of the banks' financial health. Empirical evidence by Demirguc-Kunt & Huizinga (1999), Abreu & Mendes (2002) and Goddard, Molyneux, & Wilson (2004) reported that the best performing banks are those who keep a higher level of equity relative to their assets. The effect on profit is expected to be positive.

Diversification is the ratio of non-interest income by total income. The effect on profit is undetermined. Whereas Demirguc-Kunt & Huizinga (1999), Stiroh (2004) and European Central Bank (2015) find that a greater reliance on non-interest income (generated by fees and commissions) is linked with weaker bank profitability, Carbo Valverde & Rodríguez Fernández (2007) defend that a banks with a more diversified revenue stream is more profitable. On the other hand, Gambacorta, Scatigna, & Yang (2014) find that the impact of revenue diversification is non-linear – diversification is beneficial for banks only up to a certain degree.

Lending, calculated as the ratio of Total loans over total assets, impacts profitability by its effect on net interest margin and credit risk. It affects profitably positively by augmenting the loan portfolio however, may, in turn impact its quality – deteriorating profits. According to Dietrich & Wanzenried (2010), Trujillo-Ponce (2013) and European Central Bank (2015) the sign is expected to be positive.

Liquidity is defined by loan-to-deposit ratio and represents how the banks capacity in converting the captured deposits and converting them into deposits (Arce et al., 2018). The expected sign of the coefficient is positive (Rengasamy, 2014).

Credit risk proxy is calculated as loss provisions to total loans ratio. Loan loss provision directly affects bank profitability since banks have to put some money aside to face any

potential loans default and this is deducted from net profits. Hence, a negative relationship between credit risk – higher level of provisioning - and profitability (Athanasoglou et al., 2004; Trujillo-Ponce, 2013; Borio et al., 2015; European Central Bank, 2015).

4.1.2.2 Macroeconomic Characteristics

The macroeconomic variable captures the fluctuations of the economic cycle.

Real GDP Growth (GDP) is the main indicator of a country's economic health. A positive relationship is expected (e.g. Athanasoglou et al., 2004; Albertazzi & Gambacorta, 2009; Kanas, Vasiliou, & Eriotis, 2012). Given the low inflation period under analysis, I consider that real GDP growth is enough to capture macroeconomic conditions that may affect banks' profitability.

4.1.2.3 Interest rate environment

Assuming that the short-term interest rate reflects the general interest rate level, the 3-month EURIBOR *(Level)* is used as proxy. According to the literature, the relationship between interest rates and bank's profit margins is not clear. Busch & Memmel (2015), Altavilla, Boucinha, & Peydró (2017)**,** Bikker & Vervliet (2018) among others show that lower interest rates impair the bank's profit margins and this relationship is stronger in the negative territory. On the other hand Scheiber et al. (2016), Basten & Mariathasan (2018) and Lopez et al. (2018) among others find that the negative effect of the NIRP has been offset.

Literature also points towards the relevance of the yield curve slope for profitability, besides the level of current short-term rates. Thus, the variable *slope* is constructed as the difference between long- and short-term rates. As long-term interest rate, the 10-year Portuguese government bond yield is used, while the 3-month EURIBOR is used as the short-term rate. Following Alessandri & Nelson (2012) and Bikker & Vervliet (2018) we expect a positive coefficient with NIM. The argument is that banks borrow short and lend long so a steeper yield curve would raise the gap between the sources of interest income and interest expenses.

The following Table 1 summarizes the expected effects of the explanatory variables of the model according to literature and an overview of the calculations of all variables.

Table 1: Overview Explanatory Variables - Baseline Model

Variable	*Description*	*Expected Effect*
	Dependent Variable	
Net Interest Margin (NIM)	Difference between interest income and interest expense divided by total assets	
	Explanatory Variables	
	Bank-specific variables	
Excess Liquidity	Reserve holdings in excess of minimum reserve requirements to total assets	-
Deposit Ratio	Deposits to total assets	-
Size	Logarithm of total assets	+/-
Capitalization	Total equity capital over total assets	+
Diversification	Total non-interest income divided by total income	+/-
Lending	Total loans over total assets	+
Credit risk	Provision for credit losses over total assets	-
Liquidity	Total loans over Total deposits	+
	Macroeconomic Characteristics	
Real GDP growth	GDP growth rate	+
	Interest rate environment	
Level	3-month money market rate	+
Slope	10-year Portuguese government bond minus 3-month money market rate	+

4.2 Methodology

The present section analyses the empirical methodology deployed in the Dissertation. In order to identify the impact of negative interest rates on profitability this Dissertation relies on a multiple linear regression (MLR) model. To differentiate between "normal" times and negative interest rates policy by the ECB, one interaction term ($NIRP_t$) is interacted with the most relevant explanatory variables in order to understand if the usual relationships may differ under negative rates environment.

Our baseline model is the following:

$$\Pi_{i,t} = \alpha + \beta_1 excess\ liquidity_{i,t-1} \text{x}\ NIRP_t + \beta_2 deposit\ ratio_{i,t-1} \text{x}\ NIRP_t + \beta_3 level_{i,t} \text{ x } NIRP_t + \beta_4 \text{slope}_t \text{ x } NIRP_t + \varepsilon_{i,t} \quad (1)$$

$\Pi_{i,t}$ is the profitability measure (NIM) for bank i in year t.

$NIRP_t$ is a dummy variable ($NIRP_t$) that is equal to one from the introduction of negative interest rates in the deposit facility rate by the ECB in June 2014 and zero before.

The most relevant explanatory variables are: $level_t$ of short-term interest rate, the $slope_t$ of the yield curve, *Deposit ratio* of bank i in time t-1 and *Excess Liquidity* bank i in time t-1.

$$\Pi_{i,t} = \alpha + \beta_1 deposit\ ratio_{i,t-1} \text{x}\ NIRP_t + \beta_3 excess\ liquidity_{i,t-1} \text{x}\ NIRP_t + \beta_2 \text{slope}_t \text{ x } NIRP_t + \beta_4 level_{i,t} \text{ x } NIRP_t + X_{i,t-1} + Z_t + \varepsilon_{i,t} \quad (2)$$

Building on Model (1), the following extensions are consider: First, to account for bank specific effects $X_{i,t-1}$ denotes a set of bank explanatory variables. These variables are *Size*, *Diversification*, *Lending*, *CreditRisk* each lagged by one period to mitigate concerns of endogeneity. Additionally, Z_t represents Portugal GDP growth rate as a macro explanatory variable which is the same to all banks i. For additional robustness, we re-run Model (1) removing banks that were under an intervention. They are not included during the semester of the intervention and the following semester.

We replicate model 2 of our analysis using the Interest Income Margin and Interest Expense Margin as our explanatory variable in order to study further how the components of Net Interest Income are affected by the NIRP.

Next, to understand the relationship between different measures of profitability, a regression with fixed effects between ROE and NIM is used.

$$\text{ROE}_{i,t} = \alpha + \beta_1 \text{NIM} + \eta_i + \varepsilon_{i,t} \quad (3)$$

4.3 Data

The primary source of data is the Portuguese bank association - Associação Portuguesa de Bancos (APB) – that reunites the banks' balance sheets and income statements of the banks of

over 90% of the assets in Portugal's banking system. To increase observations, the yearly income statement is deducted from the correspondent first semester income statement and in case of missing data points the report of the bank is consulted. Bank-specific variables are built from data on balance sheet and income statement items. The data on gross domestic product (GDP) growth and long-term interest rate (10-year Portuguese government bond) is extracted from the OECD Main Economic Indicators database. The ECB Statistical Data Warehouse is used to obtain the short-term interest rate. For the macroeconomic indicators semester averages are computed.

The dataset used for the estimation covers the first semester from 2010 to the last semester of 2017, yielding T =16 and a total of 434 observations. The choice of the period for analysis was made in order to include the period before and after the introduction of negative rates in the euro area. Originally, the data included 44 banks, but due to inconsistencies, 8 were removed, thus arriving at a sample of N =36. In order to avoid selection bias we run two separate regressions, one that includes all the banks - including bankrupt banks and banks that suffered mergers or acquisitions - are kept in the sample and another one were we remove the banks that were under an intervention, for the period of that intervention.

Table 2: Characteristics of the Data

Year	*Semester*	*Number of Banks*
2010	1	30
2010	2	30
2011	1	30
2011	2	30
2012	1	28
2012	2	28
2013	1	27
2013	2	27
2014	1	28
2014	2	24
2015	1	28
2015	2	25
2016	1	26
2016	2	24
2017	1	27
2017	2	26

To further describe the sample of acquirers, Table 3 summarizes the dependent and independent variables. To avoid that our results are incorrectly influenced by outliers, all bank-level data are winsorized at the 1 and 99 percent levels. The table reports the mean, median, 25th percentile, and 75th percentile, standard deviation, minimum and maximum of each variable in the sample.

Table 3: Summary Statistics

Variable	*Obs.*	*Mean*	p50	p25	p75	*Std. Dev*	*Min*	*Max*
NIM (%)	434	0.63	0.59	0.41	0.86	0.36	-0.23	2.74
ROE (%)	434	0.95	2.24	-2.01	7.33	13.67	-64.56	31.59
Deposit ratio (%)	434	65.33	66.10	51.03	83.45	20.27	16.11	96.85
Excess liquidity (%)	434	13.71	12.23	5.76	19.85	10.06	0	44.56
Size[7] (Millions €)	434	146.12	25.77	7.89	152.91	233.09	2.33	1021.44
Credit risk (%)	407	162.80	5.10	55.81	0.31	-521.40	4,75	0
Lending (%)	434	60.83	64.01	46.70	75.34	19.84	9.37	93.32
Diversification (%)	434	36.48	33.39	21.68	45.59	22.15	-1.43	120.50
Level (%)	434	0.36	0.23	-0.06	0.87	0.57	-0.33	1.53
Slope (%)	434	5.40	4.06	3.26	7.37	2.75	2.27	11.43
GDP (%)	434	0.05	0.40	-1.37	0.95	0.702	-1.37	0.96

To further describe the data before estimating the model, Table 7, in appendix 2, shows the pairwise correlation between the main variables and their significance level. Correlations indicate the relationship between the variables but they do not imply causation. From the results of the correlation coefficients, we can conclude, that correlation the coefficient between ROE and NIM is positive 0.2823. This is also a very basic method to detect any multicollinearity issues[8].

[7] Presented here in euros, used in the regressions in (logs)
[8] To avoid multicollinearity problems, the variables Liquidity, Leverage and Capital, are not included in the regressions.

5 Results

5.1 Net Interest Income

Table 4 contains our baseline model results. Column (1) reports results for the regression between NIM and relevant explanatory variables, column (2) adds lagged bank-specific controls and the macroeconomic control while in column (3) the banks that were under an intervention are removed from the analysis - during the period of the intervention that is considered to be semester during the intervention and the one after.

Beginning with the bank specific effects and the interaction term, there is a negative relationship between the deposit ratio and net interest income. The results suggest that banks with a higher share of deposits have lower profitability. This negative relation is weaker under NIRP, implying that high deposit banks, which could be ex-ante more vulnerable to NIRP, seem to be able overcome the constraint on deposit rates. However, this could be related with the still high level of interest rates of deposits in Portugal during the period considered, meaning that such constraint was not binding, and thus did not impact banks' profitability. The results are consistent including or not the banks that were under an intervention.

The excess liquidity gives the direct cost of NIRP. Prior to NIRP, the coefficient is positive, meaning that banks with more deposits with the central bank are usually more profitable banks. After the introduction of NIRP, the coefficient turns lower (positive or null), in line with the hypothesis that these banks may be more affected by NIRP given that they have to pay for their excess liquidity holdings.

We do not see any clear relationship between profitability and change in the level of short term rates (3-month Euribor) nor the change in slope of the yield curve in the time frame analysed, before or after the introduction of NIRP. To shed further light on the matter in part 5.2, we explore further by decomposing the components NIM into Interest Income Margin and Interest Expense Margin.

Besides these main ways through which negative rates may affect banks profitability, it is relevant to access other variables that may be relevant in both environments.

Size has a significant negative weight on NIM, i.e., larger banks are less profitable. A possible explanation is that larger banks do not benefit from economies of scale, but rather face diseconomies of scale due to more complex processes, which lowers their profitability. In the literature, there is no consensus on the expected sign, which may also suggest that the

negative coefficient found may be related to the period considered. A broader analysis would be advisable to withdraw more definite conclusions. After removing from the regression the banks under intervention, the coefficient becomes more negative, this could mean that for this specific bank diversification has a more positive impact.

Once we remove the banks during the periods that were under an intervention, we find that lending contributes positively to a better performance of banks – as previously expected. In particular, one percentage point increase in Lending is related to an increase in NIM by 0.8 basis points. Although this is an economically weak result, this is an important illation for banks that by expanding their lending portfolio could possibly increase their revenue from interest income relative to their interest expenses. However, this could also be made at the cost of loans with lower quality and higher prices, increasing the risk taken by banks.

Furthermore, banks with higher Diversification, hence greater reliance on non-interest income are associated with smaller Net Interest Margins.

Changes in real GDP growth are not significantly correlated with the evolution of bank profitability, i.e., Portuguese macroeconomic conditions are not relevant when we take into account the other bank characteristics.

Table 4: OLS Regressions – Net Interest Income

Dependent Variable	(1) Baseline Regression	(2) Baseline Regression with Control Variables	(3) Banks under Intervention Removed
0b.NIRP#c.ExcessLiquidity, lag	-0.00260	0.0117***	0.0221*
	(0.00380)	(0.00433)	(0.0122)
1.NIRP#c.ExcessLiquidity, lag	-0.00491**	0.00541**	0.00758
	(0.00228)	(0.00249)	(0.00500)
0b.NIRP#c.DepositRatio, lag	-0.00447***	-0.00526***	-0.00907***
	(0.00117)	(0.00141)	(0.00196)
1.NIRP#c.DepositRatio, lag	-0.00138	-0.00340***	-0.00103***
	(0.00115)	(0.00121)	(0.00260)
0b.NIRP#c.Level	0.0907	0.0740	0.0556
	(0.0622)	(0.0562)	(0.113)
1.NIRP#c.Level	-0.0781	0.00300	-0.00495
	(0.110)	(0.103)	(0.180)
0b.NIRP#c.Slope	-0.00191	-0.00653	-0.0348
	(0.0112)	(0.0139)	(0.0290)
1.NIRP#c.Slope	-0.0151	0.00430	0.0333
	(0.0318)	(0.0266)	(0.0444)
Size, lag		-0.107***	-0.206***
		(0.0230)	(0.0415)
Credit risk, lag		-2.50e-06	5.41e-05
		(2.63e-05)	(4.98e-05)
Lending, lag		0.00173	0.00815***
		(0.00112)	(0.00254)
Diversification, lag		-0.00875***	-0.0106***
		(0.000839)	(0.00298)
GDP		-0.0103	-0.0634
		(0.0446)	(0.0763)
Constant	0.859***	1.708***	2.451***
	(0.107)	(0.186)	(0.323)
Observations	394	391	348
R-squared	0.063	0.312	0.188

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2 Interest Income Margin and Interest Expense Margin

In table 5 we can find the components of NIM, split into Interest Income and Interest Expense normalized by total assets.

Excess liquidity, which was expected to affect negatively interest income, appears to be an irrelevant factor for Interest Income and Interest expense. Thus, this might suggest that the way banks' net margin is positively affected by excess liquidity is very heterogeneous.

Banks more reliant on deposits should have a greater impact from NIRP on their interest expenses. We observe that the deposit ratio has a negative relationship with both components. Contrary to what could be expected, interest expenses are larger for banks with lower deposit ratios, both under positive and negative rates territory, although slightly stronger in the former. The deposit ratio is also relevant to understand interest income, as banks more reliant on deposit funding show lower interest income, slightly more under NIRP.

We find that for both Interest Income Margin and Interest Expense Margin, there is a positive coefficient with the Level of short-term interest rate. However, only after the introduction of NIRP this relationship becomes significant. Corresponding to a one percentage point increase, the Interest Income Margin is found to be 0.994 percentage points higher while the Interest Expense Margin is 1.004 percentage points higher. This finding implies that after the introduction of the Negative interest rate policy lowering the interest rate is associated with lowering both of these components. This is in line with the monetary policy pass-through during this period, while between 2010 and 2014 one could argue that the pass-through was impaired amid the euro area sovereign debt crisis which hit particularly Portugal. Moreover, the fact that the coefficients are similar in both regressions may help explain the overall null effect of the short-term rate on the net interest margin.

Regarding the slope, we only find a significant relationship for the Interest Expense Margin before the NIRP, whereas a one percentage point increase, is associated with an increase by 8.63 basis points. Here, a steeper yield curve is positively associated with Interest Expense Margin, however after the NIRP and for the Interest Income Margin we find no significant positive relationship, possibly related to the flattening of the yield curve in this period.

Diversification exhibits a strong negative relationship with Interest Income Margin, this relationship doesn't appear to be significant for the Interest Expense Margin. This suggests

that the more banks are dependent on non-interest income the smaller the Interest Income Margin.

Table 5: OLS Regressions – Interest Income Margin and Interest Expense Margin

Dependent Variable	**Interest Income Margin**	**Interest Expense Margin**
0b.NIRP#c.ExcessLiquidity, lag	0.0118	0.00336
	(0.0137)	(0.0147)
1.NIRP#c.ExcessLiquidity, lag	0.00936	-0.00225
	(0.00824)	(0.00683)
0b.NIRP#c.DepositRatio, lag	-0.0202***	-0.00884**
	(0.00396)	(0.00384)
1.NIRP#c.DepositRatio, lag	-0.0210***	-0.00771*
	(0.00460)	(0.00400)
0b.NIRP#c.Level	0.0592	0.0588
	(0.165)	(0.158)
1.NIRP#c.Level	0.994***	1.004***
	(0.323)	(0.298)
0b.NIRP#c.Slope	0.0495	0.0863**
	(0.0372)	(0.0336)
1.NIRP#c.Slope	0.0360	0.0413
	(0.0731)	(0.0624)
Size, lag	-0.0522	0.0823*
	(0.0516)	(0.0448)
Credit risk, lag	-4.05e-05	-1.90e-05
	(6.32e-05)	(7.74e-05)
Lending, lag	-0.000621	-0.00597
	(0.00363)	(0.00366)
Diversification, lag	-0.00831***	0.000513
	(0.00229)	(0.00200)
GDP	-0.0416	0.0663
	(0.1209)	(0.1212)
Constant	3.369***	0.961***
	(0.465)	(0.347)
Observations	391	391
R-squared	0.304	0.238

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.3 Return on Equity

This Dissertation uses NIM as the main financial performance indicator. However, ROE is also commonly used as measure of bank's profitability. In order to understand if indeed the two measures are related, I regress the ROE against the NIM including banks fixed effects. Such fixed effects remove unobserved bank-level heterogeneity, given that, for example, a given bank may have by default higher ROE due to its business model. From table 6, we find that - as expected - a higher NIM is correlated with a higher ROE. In particular, one percentage point increase in NIM is related with an increase in ROE by 9.574 percentage points - at 5% level significance. A higher ability of a bank to earn a margin and its ability to minimize the deposit rate and maximize the loan rate is positively associated with a higher capacity in using a shareholder's investments to create profits. In Appendix 3, figure 2, we can observe this relationship between ROE and NIM on a Scatter Plot.

Table 6: OLS regression with fixed effects – ROE

VARIABLES	(1) Fixed Effects
NIM	9.574**
	(4.624)
Constant	-5.676*
	(2.917)
Observations	434
Number of banco	35
R-squared	0.022
Bank FE	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6 Conclusion and Future Research

The aim of this thesis was to study the impact of the introduction of Negative Interest Rate Policy on the profitability of Portuguese banks. The study uses balance sheet data from 36 banks, over 14 semesters for the period 2010-2017. Two time intervals were used, one including the first semester of 2010 to the first semester of 2014 and another one referring to the period after the introduction of the NIRP from the second semester of 2010 to the second semester of 2017 in order to present the differences in the behaviour after the introduction of the policy.

This study focused on the main drivers of the banks' net interest margins, whose higher vulnerability has been in the spotlight since the crisis. Bank profitability is a key concern for the financial stability and for monetary policy across the Euro Area. The ECB's monetary policies were implemented to boost economic recovery after the Global Financial Crisis, but bank profitability remains structurally low.

Through this paper intends to contribute to the limited literature on the Portuguese Financial Sector by adding a deeper comprehension of the monetary transmission mechanism as well as determining the impact of this unconventional monetary policy.

In the present Dissertation, a Multiple Regression analysis was deployed, using the Net Interest Income as our main ratio of Banks' performance. To understand how the different components of NIM were affected we have decomposed them into Interest Income Margin and Interest Expense Margin.

Despite much dire commentary from the industry, Portuguese banks seem thus far to have had a relatively benign experience under negative nominal interest rates. We find little overall impact of negative nominal rates on bank profitability, compared with a low positive rates period.

Nonetheless, our results suggest that the direct cost of NIRP is relevant, i.e., that banks with higher excess liquidity are more affected by the NIRP since it works as a tax on excess liquidity hoarding.

To some extent Portuguese banks seem to be able to compensate for the negative interest rate environment. We see a negative relationship between deposit ratio and bank interest income after the introduction of the policy, since banks are not able to pass negative interest rates fully on to their costumers but on the other hand bank interest expenses also appear to decline.

Overall, we see that the relationship between deposit ratio and Net Interest Margin weakens after the introduction of the NIRP. This indicates that high deposit banks (expected to be more vulnerable to NIRP) are able to overcome the constraint on deposit rates.

Our results do not show any clear relationship between NIM and the change in the level of short-term rates nor the change in slope of the yield curve. Moreover, the different components of income respond significantly; after the introduction of the NIRP lowering the level of short-term interest rate is associated with lower Net Interest Income but this is offset by lower Net Interest Expenses. Before the NIRP we see that a steeper yield curve is positively associated with Interest Expense Margin, however, after this relationship is not found to be significant, one could argue that it is due to the flattening of the yield curve in this period.

Regarding bank-specific variables, after removing the banks during the period that they were under intervention we find Lending to have a positive correlation with profitability. This suggests that banks could increase their NIM by expanding their lending portfolio. However, this could also be made at the cost of loans with lower quality and higher prices, increasing the risk taken by banks. On the contrary, size (as measured by log of total assets), shows to have a significant negative impact over bank profitability in the period under investigation. Moreover, Diversification hence greater reliance on non-interest income is associated with lower Net Interest Margins.

ROE and NIM are important measures of financial performance. We find that a higher ability of a bank to earn a margin and its ability to minimize the deposit rate and maximize the loan rate is positively associated with a higher capacity in using a shareholder's investments to create profits.

For future research, it would be interesting to study further how banks are compensating for this negative interest environment, for example are they relying more on non-interest income or taking higher risks.

Our study comes with certain limitations. First, negative interest rates are relatively recent phenomena so the long run effects of negative interest rates will possibly differ from the short term ones, causing either a weakening or a strengthening of the results. A straightforward regression model was deployed to study the effects of NIRP on the chosen indicators, which can very well be adequate to show underlying relationships. We could improve this methodology by creating a more complex and specific model that would allow non-linear

relationship as well as trying different control variables in order to clear away the ambiguity in the results.

Concluding, this Dissertation added further understanding on the impact of the Negative Interest Rates Policy on Profitability. Central banks should keep considering additional measures that will prevent the rise of financial industry fragility and consequent economic disequilibrium, keeping in mind that numbers only tell part of the story and investigate what drives them is crucial.

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8 Appendices

Appendix 1: Evolution of Interest Rates

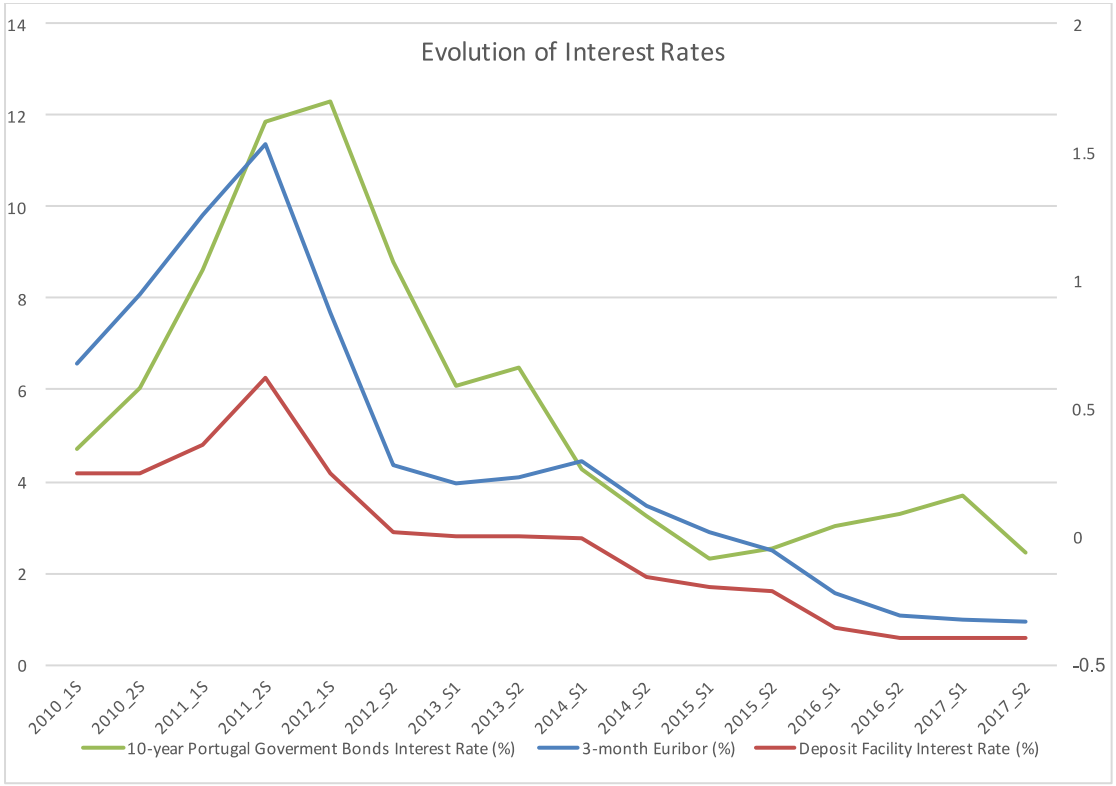

Figure 2: Evolution of Interest Rate

Appendix 2: Scatter plot between ROE and NIM

Variables	ROE	NIM	Deposit Ratio	Excess Liquidity	Size	Credit Risk	Lending	Diversification	Level	Slope	GDP
ROE	1.0000										
NIM	0.2823*	1.0000									
Deposit Ratio	-0.0017	-0.2212*	1.0000								
Excess Liquidity	0.0353	-0.1515*	0.2826*	1.0000							
Size	-0.2084*	-0.2176*	-0.0882*	0.1140*	1.0000						
Credit Risk	0.1792*	0.1226*	0.0284	-0.1005*	-0.4112*	1.0000					
Lending	-0.0483	0.0016	0.3980*	-0.1013*	0.1670*	-0.0433	1.0000				
Diversification	-0.0967*	-0.5056*	0.0718	0.4375*	0.0278	-0.0132	-0.1736*	1.0000			
Level	-0.0042	0.0005	-0.1202*	-0.3242*	0.0625	0.0972*	0.1259*	-0.0844*	1.0000		
Slope	-0.0692	-0.0321	-0.1018*	-0.2569*	0.0616	0.1310*	0.0709	-0.0742	0.7194*	1.0000	
GDP	0.0221	0.0100	0.1034*	0.2401*	-0.0484	-0.0780	-0.0530	0.0639	-0.6772*	-0.8428	1.0000

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Correlation Table

Appendix 3: Scatter plot between ROE and NIM

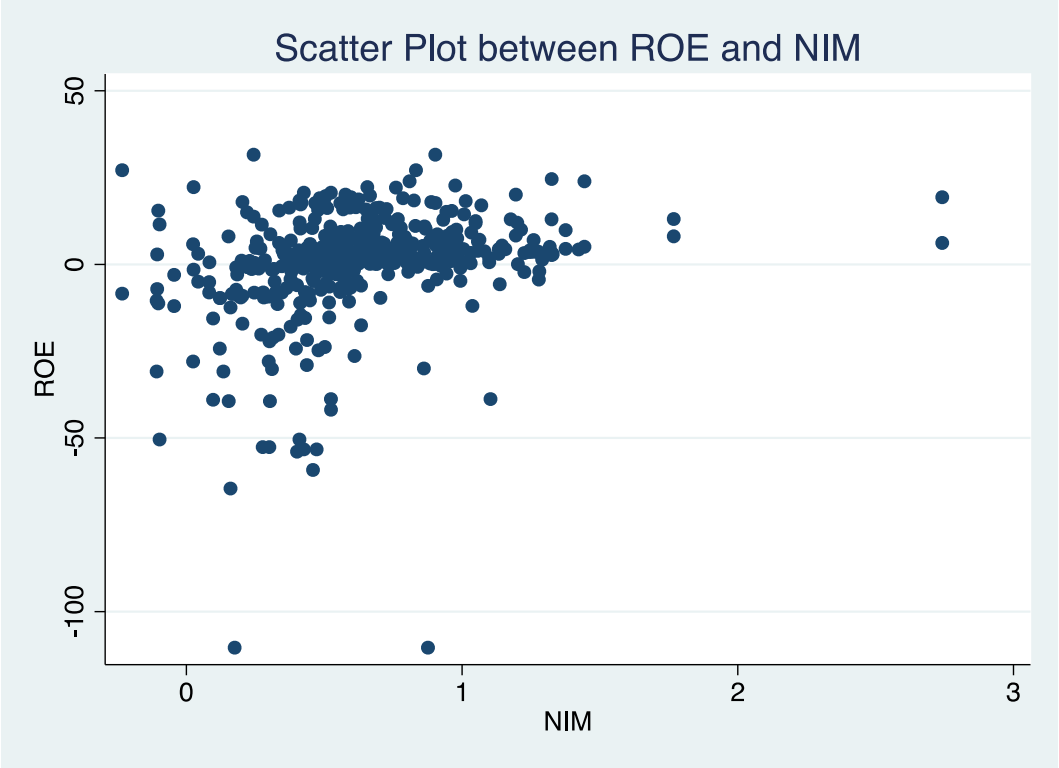

Figure 3: Scatter plot between ROE and NIM

Appendix 4: List of Abbreviations

APB Associação Portuguesa de Bancos

BES Banco Espírito Santo

BESI Banco Espírito Santo de Investimento

BPN Banco Português de Negócios

BPP Banco Privado Português

CGD Caixa Geral de Depósitos

CMVM Comissão do Mercado de Valores Mobiliários

DFR Deposit Facility Rate

DNB Danmarks Nationalbank

EC European Comission

ECB European Central Bank

EEC European Economic Community

FAP Financial Assistance Programme

GDP Gross Domestic Product

IMF International Monetary Fund

LLP Loan Loss Provisions

NIM Net Interest Margin

NIRP Negative Interest Rates Policy

ROA Return on Assets

ROE Return on Equity

SNB Swiss National Bank

SR Swedish Riksbank

UMP Unconventional Monetary Policy