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The effect of interest rate policy on bank profitability and valuation in advanced economies

A low-interest rate environment perspective

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ABSTRACT:
This thesis examines the impact of interest rate changes on bank profitability and valuation in advanced economies, with a particular focus on low-interest rate environments. The study aims to explore how fluctuations in interest rates influence banks' revenue channels, profitability and risk-taking behavior and how these factors collectively effect their market value. The findings suggest that profitability tends to be squeezed with interest rate reductions. In addition, prolonged periods of near-zero or negative interest rates can significantly erode banks' profitability, while increasing reliance on alternative, more volatile revenue sources. Moreover, the research highlights that market reactions to interest rate changes are complex and while bank stock prices tend to rise with unexpected cuts in interest rates, they are also influenced by multiple macroeconomic factors and investor sentiment.

KEYWORDS: Key interest rate, Profitability, Banking sector, Risk-taking, Valuation, Monetary policy.

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TIIVISTELMÄ:

Tämä tutkielma tarkastelee korkotason muutosten vaikutuksia pankkien kannattavuuteen ja markkina-arvostukseen kehittyneissä maissa, erityisesti keskittyen matalan korkotason ympäristöön. Tutkimuksessa analysoidaan, kuinka korkojen vaihtelut vaikuttavat pankkien tulonmuodostukseen, kannattavuuteen ja riskinottoon, ja miten nämä tekijät yhdessä heijastuvat pankkien markkina-arvoon. Tulokset osoittavat, että kannattavuus heikkenee yleensä korkotason laskiessa. Pitkällä aikavälillä lähellä nollaa olevat tai negatiiviset korot merkittävästi heikentävät pankkien kannattavuutta, luoden samalla riippuvuutta vaihtoehtoisista, usein epävakaammista tulolähteistä. Lisäksi tutkimus osoittaa, että markkinoiden reaktiot korkotason muutoksiin ovat monimutkaisia. Vaikka odottamattomat koronlaskut tyypillisesti nostavat pankkiosakkeiden arvoa, hintakehitykseen vaikuttavat myös laajemmat makrotaloudelliset tekijät ja sijoittajien odotukset.

AVAINSANAT: Ohjauskorko, Kannattavuus, Pankkiala, Riskinotto, Arvottaminen, Rahapolitiikka.

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1 Introduction

Interest rates have become a central focus in finance due to their profound impact on markets, especially the banking sector. Unlike many other financial variables that emerge from market forces, interest rates are primarily set by central banks. Even though monetary policy can be symptomatic of the economy, interest rates themselves are a policy instrument rather than purely market-driven outcomes. This distinction is crucial as it implies that changes in interest rates can introduce distortions or unintended consequences in financial markets, particularly in banking.

Interest rates play a pivotal role in the banking sector, influencing profitability, risk-taking behavior and thus valuation. Recent evidence suggests that interest rate changes negatively effect profitability of banks, and especially low-for-long interest rate policy may have an eroding effect on bank profitability (Claessens et al., 2017; Borio et al., 2017; Bikker & Vervliet, 2018). Interest rates have remained low for decades and are likely to persist (Segev et al., 2024), which is why a heavy emphasis in this thesis is on the low-interest rate environment.

The profitability section of the thesis is guided by Altavilla et al. (2018) studying the effects in Europe, Bikker and Vervliet (2018) studying the effects in America and cross-country evidence is provided by Claessens et al. (2017) and Borio et al. (2017). The methodology in these studies is quite similar as well as the results, with only a few differences, which will be covered in later chapters. Given the close relationship between interest rates and the yield curve, this thesis also incorporates findings from Alessandri and Nelsson (2015), whose research highlights the implications of interest rate shifts on bank performance through changes in the yield curve. Most of the literature covered in this thesis touches on the relationship, making it a recurring theme in the discussion.

Although negative interest rates fall outside the primary scope of this thesis, they will still be briefly examined due to their unique implications on profitability and valuation.

The studies of Heider et al. (2021) in Europe and Hong and Kandrac (2021) in Japan highlight how negative interest rates create exclusive challenges for banks, particularly by limiting the pass-through to deposit rates, compressing net interest margins even more than low interest rates, and influences banks' risk appetite.

To examine risk-taking, this thesis explores risk-taking behavior and alternative revenue strategies that banks adopt when their traditional income sources decline. The overall view on interest rates and risk-taking and the credit monitoring process is contributed by Zhang et al. (2024). Chen et al. (2017) provides the key insights into how banks adjust their business models in response to lower interest rates and how non-interest income effects the overall riskiness of banking business. Additionally, Ender and Neuhofer (2021) contribute a comprehensive literature review on risk-taking behavior during periods of low interest rates.

Finally, to assess the impact of interest rate changes on bank valuation, this paper applies mathematical frameworks primarily based on Pinto et al. (2015). These theoretical frameworks are then compared to empirical findings by English et al. (2018), Chen et al. (2022) and other previously cited sources, as some of them also provide insights into valuation effects.

1.1 Purpose of the thesis

The purpose of the paper is to examine the effects of interest changes to bank activities, focusing on profitability metrics and risk-taking and using the findings to estimate the impact on bank equity valuations and combining the existing literature to get a full understanding of the effects of interest rate changes on banking. While the effects of interest changes on bank profitability and valuation is a studied subject, many of the relevant papers focus on one or the other. Since valuation, according to modern financing theories, is heavily based on cash flows and risk, this thesis studies them both and combines

the existing literature of the effects of interest rate changes on them and adds them to bank valuation.

Because banks' net interest margins are reduced by downward changes in the interest rate the overall profitability should also drop, bringing us to the first hypothesis:

H_1: Interest rates are positively correlated with overall bank profitability.

Second, if profitability is hindered by downward interest rate changes, then the cash flow component of valuation models should be reduced, thus lowering the valuation of the (bank) stock. So, the secondary hypothesis is:

H_2: The stock market valuation of bank equity is positively correlated with interest rates.

We contribute to existing research by integrating findings from multiple studies. This paper is primarily aimed for investors, since understanding profit making models and risk-taking is crucial for calculating valuation. Other information such as discount rates and overall economic state is widely available for investors, which is why the focus of the thesis is on profitability, with valuation being examined in a more concise manner.

1.2 Structure of the thesis

This thesis is divided into five chapters with four following this one. Chapter two provides the theoretical framework on which this study is based upon and is split between mechanisms and mathematical theories. Chapter three explores the effects of interest rate changes on bank profitability and risk-taking. In chapter four the findings of chapter three are considered by applying the models discussed in chapter two to analyze the effects of interest rate changes on bank equity valuation and examine empirical evidence on the topic. This paper concludes in chapter five, drawing together the findings and discussing avenues for future research.

2 Theoretical background

The theoretical background provides framework for analyzing the relationship between interest rates and bank profitability and valuation. The key theories examined in this section are the efficient market hypothesis (EMH), the risk-return trade-off, the interest rate pass through mechanism, the capital asset pricing model, discounted and free cash flow models and the price-to-earnings model. These frameworks will give a foundation for empirical findings in later sections.

2.1 Mechanisms relevant to the thesis

In this section we explore the theoretical mechanisms that underpin the relationship between interest rates, banking and bank valuation. These mechanisms explain how monetary policy changes effect bank profitability and risk exposure ultimately influencing stock prices. These mechanisms are complimented by the mathematical theories in the later section, which provide quantitative insights into valuation dynamics.

2.1.1 Efficient market hypothesis

The efficient market hypothesis suggests that financial markets fully reflect all available information, meaning stock markets react immediately to new data (Fama, 1970). In the context of banking, this implies that changes in interest rates should be quickly incorporated into stock prices, which minimizes the opportunities for excess returns. Fama (1970) splits market efficiencies into three categories weak from, semi-strong form and strong-form. The weak form illustrates markets that reflect past information including trading volumes and past prices, the semi-strong form presumes that markets reflect all information available to the public and the strong form suggests that all information including insider is seen in market prices of assets.

For this thesis we examine the effect of interest rate changes both as a surprise and as expected outcomes in chapter 4. EMH provides guidelines for what to expect from them, since the expected outcome should already be reflected in the stock prices of (bank) assets.

2.1.2 Risk-return trade-off

The risk return trade-off is closely linked to the EMH, being a fundamental part of stock valuation theories. It states that with greater risk there should be higher potential returns. This concept is particularly relevant to banking, as their risk-taking behavior is effected by interest rate changes, as highlighted in later chapters. Lower interest rates tend to encourage banks to take more risk and lower their provisioning for credit losses (Bikker & Vervliet, 2018).

This concept is further developed by Fama and French (1992), where they demonstrate that risk factors such as size and book to market value contribute to variations in expected returns. Their findings suggest that risk-taking incentives are shaped not only by market conditions but also by firm characteristics making this trade off especially important in the banking sector. Prospect theory by Kahneman and Tversky was also considered for this thesis but remains outside the scope. It could however be an excellent avenue for further research.

2.1.3 Interest rate pass-through mechanism

The interest rate pass-through mechanism describes how changes in central bank policy rates translate into adjustments in retail lending and deposit rates. The concept pass through has been widely studied with early contributions by Mishkin (1996). In theory a complete pass-through means that policy rates are fully reflected in market rates, but as studies show this is not always the case. The European Central Bank (2006) studies the

pass through in European banks and concludes that the pass through is heterogeneous in the EU and how it can often be incomplete. This effect is more pronounced in low and negative interest rates (Segev et al., 2024).

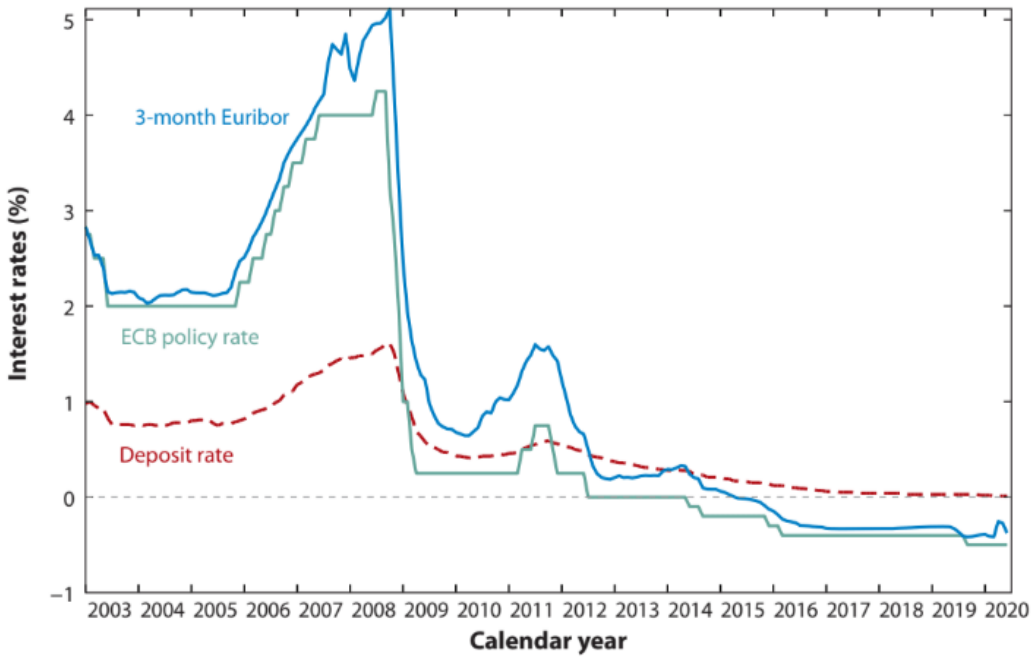

Figure 1. Interest rate pass-through (Heider et al., 2021)

As seen in figure 1, which displays the differences between ECB policy rate, the deposit rate and the 3-month Euribor, the policy rate is not instantly passed on via commercial lending and deposit channels, being in line with the literature. The positive correlation between deposit rates and policy rates also seems to end when interest rates go below the zero threshold (Heider et al., 2021).

Another crucial aspect of interest rate pass-through is its effects on the yield curve. The yield curve represents the relationship between interest rates and the maturity of debt securities. Monetary policy decisions, particularly interest rate changes and quantitative

easing can alter the shape of the yield curve. Banks typically rely on maturity transformation (borrowing short-term funds at lower rates while lending long-term at higher rates) to generate profits, so alterations to the yield curve, such as steepening, flattening or inverting, as seen in table 1, can significantly impact these profits (Alessandri & Nelson 2015). In table 1 the normal yield curve has lower short-term rates compared to long term rates, with a converse situation in the inverted yield curve and a flat yield curve represents a situation where the yield with different maturities is the same. The combined effects of interest rate pass-through and the yield curve are studied further in the literature in chapter 3.

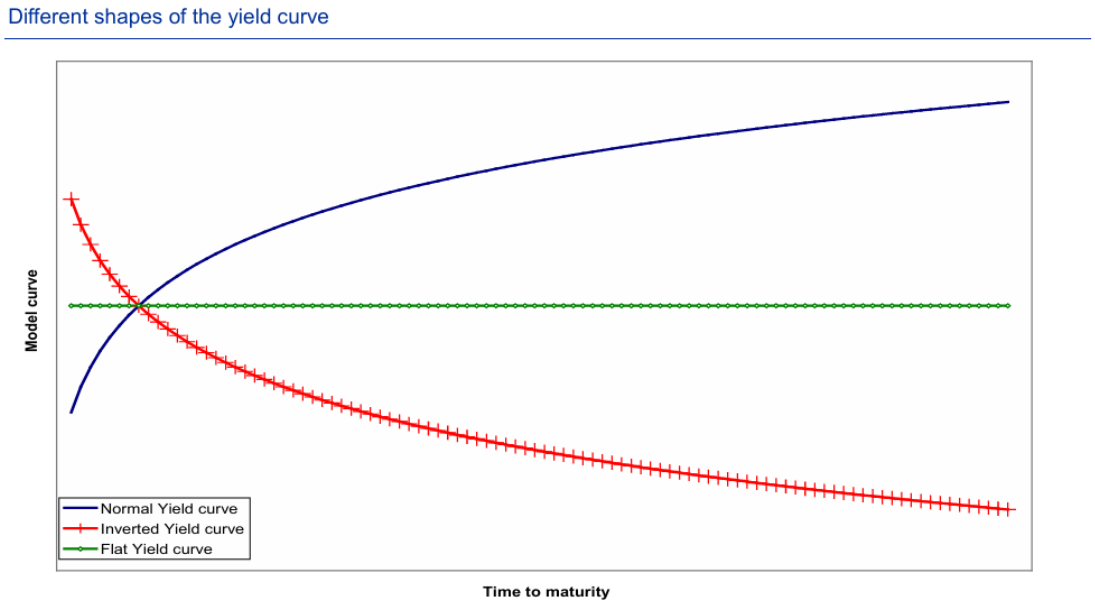

Table 1. Different types of yield curves (European Central Bank, 2018)

2.2 Mathematical theories

Mathematical models provide structured approaches into estimating bank valuation under different scenarios. These models quantify how monetary policy changes effect risk, expected returns and profitability. Even though the models are not directly applied in

this thesis, they are used to estimate the theoretical effects of interest rate changes to these formulas, which is why understanding them is crucial.

2.2.1 The capital asset pricing model

The CAP-model, developed from works by Sharpe (1964), Litner (1965) and Mossin (1966), explains how risk and more specifically systemic risk, and expected returns are related. The model states that a stocks return should be proportional to its exposure to systemic risk, as measured by beta (β). Concretely, the beta equals to the covariance of the stocks and overall market returns. The model assumes that investors are risk averse and therefore make investment decisions based on factors such as mean return and variance of their portfolios, mitigating the unsystematic risks of trading (Pinto et al., 2015, p. 61).

The CAP-model is expressed as:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \quad (1)$$

where:

- $E(R_i)$ = expected return of (banks) stock
- R_f = risk-free rate
- β_i = beta (systemic risk of the stock)
- $E(R_m)$ = expected return of the market portfolio

Equation 1. CAP-Model

Understanding the formula behind the CAP-model provides extra insight into interest rate change effects. For instance, a downward shift in interest rates lowers the risk-free term component, directly effecting the discount values and the cost of capital for banks. On the other hand, when interest rates rise, everything else being equal, stock prices should decline due to increased discount rates and borrowing costs, making CAP-model

a key tool linking together stock valuation in response to monetary policy. The model emphasizes the stocks market correlation with the underlying stock, which is valuable to us, since as we will discover later, banks strategies during low or negative interest rates tend to increase their vulnerability to market fluctuations effecting their beta.

2.2.2 Discounted and free cashflow models

The DFC model introduced by Williams in 1938 values an asset based on its expected future cashflows discounted at an appropriate rate. The theory recognizes that a given amount of money is worth more now than it is in the future, and therefore we need to discount each future cash flow to the present (Pinto et al., 2015 p. 233). For banks these cash flows are influenced by Net interest income, non-interest income and loan loss provisions, which we will take a closer look at in chapter 3. Much like with the CAP-model lower interest rates naturally reduces the discount rate, increasing the present value of future cash flows, conversely rising rates lead to higher discounting, decreasing stock valuations.

The discounted cash flow model is written as:

$$V_0 = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} \quad (2)$$

where:

- V_0 = the value of the asset at time t=0 (present)
- n = number of cashflow periods considered, with n being set to ∞ on equities
- CF_t = the cash flow (or expected cash flow, depending on risk) at time t
- r = the discount rate or the required return for the asset

Equation 2. The discounted cash flow model

Free cash flow on the other hand can't be estimated from readily available data and is based on cash flow available for distribution rather than cash flow actually paid, such as

dividends or coupons (Pinto et al., 2015, p. 296). The free cash flow model can be substituted in the discounted cash flow model by replacing the cash flow component with free cash flow. Alternatively, we can use free cash flow to equity (FCFE), which is used by Leong et al (2023), when comparing different valuation metrics on bank valuation. FCFE is the cash flow available to the holders of common equity after all the mandatory expenses, interests and payments and necessary investments and fixed capital have been made (Pinto et al., 2015, p.297). This model can also be directly inserted into the DCF formula, again replacing the cash flow component.

By incorporating these cash flow theories such as FCF and FCFE into the DCF framework gives us the ability to compare the effects on interest rates on cashflows and therefore profitability. This allows us to draw conclusions and speculate what should happen to a bank stock and profitability, at least in a vacuum.

2.2.3 Price-to-earnings (P/E) model

First proposed by Graham and Dodd (1934), the P/E model evaluates a company's stock relative to its earnings per share. Leong et al. (2023) highlight that the P/E model, specifically in the context of bank valuation, is the most accurate model that they test, making its addition to this thesis almost mandatory.

The P/E ratio is calculated as:

$$PE = \frac{Price\ per\ share}{Earnings\ per\ share} \tag{3}$$

Equation 3. Price-to-earnings model

While the numerator isn't too complicated, being the assets market price, the denominator EPS is more complicated, since it is measured from accounting and can have differences in interpretation (Pinto et al., 2015, p. 366). The most prevalent problem being,

if profits fall significantly or to the negative the P/E model loses its relevance due to the impact on the denominator, in addition accounting standards and time horizons can be varied hampering comparability. Nevertheless, the P/E-model is widely used in investing, being often the number one market value-based valuation metric (Pinto et al., 2015, p. 367). The negative aspects of the P/E-model are negated in this thesis, since we will not use it for calculation, but more of a speculative tool, to estimate the effects of profitability, to bank valuation.

By integrating these theoretical perspectives, this paper aims to establish a comprehensive framework to predict the effects of interest rate changes on banking and bank valuation. The following chapters will apply these theories to empirical findings and stock market reaction to monetary policy changes.

3 Literature review

This chapter examines how interest rate fluctuations and changes in the yield curve effect banking activity. The primary focus is on their effects on profitability and risk-taking, as these are the key factors of bank performance, also exploring which bank characteristics, such as size and balance sheet weights, effect these factors. Additionally, the section will briefly explore the implications of negative interest rates, which introduce unique challenges and adaptations for banks. The beginning analyzes the relationship between interest rates and bank profitability, laying the foundation for a deeper discussion on how banks respond to shifts in monetary policy.

3.1 The effect on profitability

This section analyzes how profitability is effected by changes in the interest rate or the yield curve. The focus is on net interest margin (NIM), net interest income, non-interest income (NII) and loan loss provisions (LLP). These key metrics collectively influence the return on assets (ROA), which the subchapter ends with. ROA is widely used as a measure of bank profitability. By examining the combined effects, this paper intends to provide a comprehensive understanding of how interest rate changes shape overall bank profitability, with a focus on low-for-long interest rates.

3.1.1 Net interest margin

Net interest margins represent the spread between interest earned on loans and interest paid on deposits, serving as a critical measurement of bank profitability. It is easy to think that the rate on deposits would closely follow the change in interest earned on loans, however it is documented that deposits face a harder zero nominal bound when compared to loans (Heider et al., 2021), as seen in the theoretical framework in figure 1. So,

a decrease in the short-term interest rates compresses the net interest margin and conversely higher short-term interest rates account for higher NIMs (Claessens et al., 2018; Campmas, 2020; Segev et al., 2024; Wang, 2025). The positive correlation with the net-interest income and the short-term interest and the slope of the yield curve is also documented by Borio et al. (2017).

Particularly in an already low-interest rate environment, banks face significant challenges in maintaining NIMs. Studies such as Claessens et al. (2018) and Argimon et al. (2023) consider that the threshold for a country to be in a low-interest rate environment is when the interest rate is below 1.25%. While short term rates are declining, banks must pass on lower rates to borrowers but are faced with the harder zero nominal bound on their deposits (Claessens et al., 2018; Wang, 2025), resulting in an asymmetrical impact: margins narrow more sharply in low-rate environments compared to period of higher rates. Claessens et al. (2018) estimate that a 1 percentage point decrease in short-term rates reduces NIMs by 20 basis points in a low-rate environment compared to only 8 basis points in a high-rate environment. This effect of already low interest rates is also documented by Deutsche Bank (2013), while researching the effects of low interest rates to Japanese banks. Wang (2025) makes an interesting discovery, finding that bank lending begins to be constrained at 8%. The figure is high, but it emphasizes the concave relationship between interest rates and NIMs.

In addition, the flattening of the yield curve, common during prolonged periods of monetary easing, compresses NIMs further amplifying the effect, since steeper yield curves, allow banks to generate profits from maturity transformations. Altavilla et al. (2018) highlight that banks' reliance on this mechanism makes profitability particularly sensitive to yield curve dynamics, and therefore to interest rate environments and changes. The prolonged flattening of the yield curve in low-for-long environments amplifies the challenges that banks face, hindering their ability to sustain profits from traditional interest-based activities. As a result, NIM rises with the short-term interest rate and in response

banks tend to raise their lending rates and reduce their lending volume, potentially by raising lending standards (Alessandri & Nelsson, 2015), making banks less risky.

The effects of NIM compression are not similar across all banks. Smaller banks, which tend to rely more heavily on traditional lending models, are therefore more vulnerable to declining NIMs in low-rate environments, while larger more diversified banks often exhibit greater resilience, leveraging fee-based income or other non-interest income streams to offset the loss in interest income (Claessens et al., 2018). However, even the aforementioned measures might not fully counterbalance the prolonged decline in profitability associated with periods of prolonged low interest rates (Altavilla et al., 2018). It should also be noted that belonging to a bank group matters, especially when considering European banks. Argimon et al. (2023) find that the impact local level of interest rate changes on banks is lessened if the bank belongs to a group since it can rely on support from other members of the group. The effect is recorded in periods of both high and low interest rates. On the other hand, standalone banks are more effected by interest rate changes (Argimon et al., 2023). Other effects, such as market concentration also effect the strength of interest rate changes to NIMs (Segev et al., 2024). More concentrated markets react to interest rate changes more moderately, contrasting the stronger effects in less concentrated markets. Segev et al. (2024) also find that during periods of prolonged low interest rates, this correlation tends to be weaker.

Despite these challenges, Borio et al. (2017) find that banks' NIMs are buffered with strategic use of interest rate derivatives and other asset-liability management tools. While these measures mitigate some of the immediate profitability pressures, the effects of NIM compression are unavoidable in prolonged low-rate environments. The overall impact on bank profitability may be mitigated by other components of the profit equation (Borio et al., 2017), such as non-interest income.

3.1.2 Non-interest income

As NIMs are squeezed, banks increasingly turn to non-interest income (NII) to sustain profitability (Bikker & Vervliet, 2018). NII comprises of revenues such as fee-based services, trading activities and commissions, which are less directly related to interest rates. This shift represents an adaptation to low interest rates but introduces new vulnerabilities, which we will cover more in the risk-taking section.

Bikker and Vervliet, (2018) study the effects on US banks, emphasizing that diversification into fee-based activities and trading income is a common strategy, particularly for larger banks with the resources to effectively develop these revenue streams. Similarly, Altavilla et al. (2018) note that while declining NIMs erode traditional income sources, the growth in NII often offsets these losses to some extent. Moreover, when short-term interest rates rise non-interest income drops (Borio et al., 2017). They find that an increase in short-term interest rates from 0% to 1% leads to a drop in NII over total assets of around 0.7 percentage points. The effect is lessened during periods of higher interest rates, much like the effect on NIMs. Much like with NIMs, a correlation between interest rates and NIIs is found, but unlike NIMs the correlation is negative.

The reliance on NII introduces new challenges. Revenues from trading activities and fees tend to be more volatile than interest-based income, exposing banks to greater earnings variability (Borio et al., 2017). Cautioning that increased dependence on market-driven revenue, such as trading activities, can amplify systemic risks, particularly during periods of financial instability. Similarly, Chen et al. (2017) observe a correlation between NII and the perceived risk in a bank. This effect will be more closely studied in later chapters.

The effectiveness of NII as a compensatory mechanism, much like the effects of NIM compressions, varies notably across banks (Claessens et al., 2018). They find that smaller banks, which might lack the proper infrastructure to generate non-interest income, struggle to offset declining NIMs with NII, whereas larger banks are better positioned to leverage NII as a stabilizing factor. The divergence suggests that while NII serves as an

important supplementary revenue source, it is not a universal solution to profitability pressures, especially in low-rate environments.

While NII offers a partial solution against declining interest income, its effectiveness depends on bank's size, business model and market conditions. The increased reliance on volatile revenue streams may raise concerns regarding financial stability and risk exposure. Another avenue that banks use to make up for lost profits is the risk-taking channel, which for the purposes of this thesis is examined via two different avenues. One being the risk appetite, which will be covered later and the other loan loss provisions, which will be examined next.

3.1.3 Loan loss provisions

Loan loss provisions (LLPs) represent the reserves set aside by banks to cover potential credit losses. They serve as a critical buffer against economic downturns. They are a key component in risk management, directly impacting bank profitability and metrics such as the return on assets (ROA).

Lower interest rates reduce borrowing costs, making debt repayment easier for borrowers, resulting in an initial decline in default rates (Altavilla et al., 2018; Bikker & Vervliet, 2018). The effect is particularly evident during monetary easing cycles, when accommodative policies support economic growth, keeping credit losses low. Conversely, when interests rise, so do the default probabilities (Borio et al., 2017). They also mention that the effect of interest rate changes on LLPs might be greater in a low-interest rate environment, complementing the previously discussed profit metrics. The concave relationship of interest rates and is recorded by Borio et al. (2017), finding that a market interest rate rise from 0% to 1% increases the provisions over total assets by 1,5%, whereas a short-term increase from 6% to 7% only increases provisioning by 0,3%. Similar results are also found regarding the level of the yield curve slope (Borio et al., 2017). On the other hand, a percentage point decrease on the short-term interest rate is linked to a

2.78 basis point decrease in LLPs, with the relationship also being concave (Bikker & Vervliet, 2018).

In a low-for-long environment, where central banks maintain persistently low or even negative rates for an extended period, additional risks to LLPs are presented. Overtime the prolonged exposure to ultra-low rates might weaken credit discipline, as banks might become more willing to lower credit standards in search of yields (Bikker & Vervliet, 2018). The gradual accumulation of credit risk under such conditions means that when the interest rates inevitably rise again, banks must rapidly increase their LLPs, leading to a profitability shock (Borio et al., 2017). In the long term, the encouraged risk-taking and the decline in protection against credit losses might also lead to increased default rates hindering bank profitability.

The effect of bank size is not as well documented on LLPs as it is on previous metrics, which is highlighted by Bikker and Vervliet (2018). However, different types of banks tend to adjust their provisioning strategies based on their business model, regulatory mandates and risk management capabilities. Bikker and Vervliet (2018) find that larger banks, with more developed risk management and more diversification, are able to maintain profitability despite interest rate fluctuations, while smaller banks may be inclined to take more risk when striving for growth.

While LLPs act as a protective measure, they also reduce bank profits when the levels of provisioning rise. In specifically low-rate environments, banks initially benefit from lower credit losses, but eventually face rising default risks and higher LLPs, which put additional pressure on profitability (Altavilla et al., 2018). The combined changes on LLPs and interest rates and risk-taking behavior shapes the ROA, which will be explored in the following section.

3.1.4 Return on assets

Return on assets (ROA) is a measure of bank profitability indicating how efficiently a bank utilizes its assets to generate income. As a ratio of net income to total assets, ROA combines both interest based and non-interest income, as well as risk related costs such as LLPs. With ROA it is possible to study the combined results of the previous metrics on bank profitability to see if the negative effects on NIMs can be compensated for by NIIs and LLPs.

The most direct link between interest rates and ROA is NIMs. In a vacuum, higher interest rates account for higher NIMs boosting ROA and conversely falling interest rates compress NIMs, limiting banks' spreads and ability to generate income on traditional lending practices (Altavilla et al., 2018; Bikker & Vervliet, 2018). This effect on ROA is offset by NII and LLP, which as discussed earlier are negatively correlated with interest rates. The combined positive effects on NII and LLP tend to at least partially offset the negative effect on NIM in the context of ROA (Bikker & Vervliet, 2018; Argimon et al., 2023). Bikker and Vervliet (2018) also find that an increase of one percentage point in provisioning decreases profits by 13.26 percentage points, since provisions are directly deducted from net profits.

Borio et al. (2017) find a positive association between ROA and the level of interest rate and the slope of the yield curve. Claiming that higher levels of interest rates and a steeper yield curve boost overall profitability. But, in the short-term, rate cuts typically steepen the yield curve as short-term rates fall more sharply than long-term rates. This steepening might temporarily enhance banks' profitability by widening the spread of the borrowing and lending rates (Claessens et al., 2018). However, the yield curve will begin to flatten after a while as long-term rates also decline due to market expectations of prolonged low rates. Bikker and Vervliet (2018) find a positive connection between interest rates and the ROA. They claim that a one percentage point increase in interest rates leads to an increase of 1.17 basis points in the ROA, noting that the relationship is concave. The positive correlation between the slope of the yield curve and ROA is also

recorded by Claessens et al. (2018). Additionally, Altavilla et al. (2018) claim that there is an association with monetary policy rates and the yield curve and bank profitability, but considering other variables such as expected GPD growth the effects may be negated or become statistically meaningless. English et al. (2018) find similar results when controlling for macroeconomic variables such as GDP. Finding that while first increases in market interest rates do in fact boost ROA, after a few quarters the positive effects are negated in response to the changes in the yield curve and eventually even reverse.

The effect of interest rate changes to ROA is, much like with previously mentioned metrics, concave, with a larger impact when interest rates are already low (Borio et al., 2017). They record a 0.4 percentage point increase in ROA when the short term is raised from 0% to 1 %, and a 0.15 percentage point increase when the short term increases from 6% to 7%. This suggests that at very low rates banks struggle to generate profits, which might make them sensitive to changes in monetary policy. Initially banks can maintain their ROA, by expanding their lending practices and lowering provisions, but as low rates persist, profitability begins to erode (Hong & Kandrac, 2021).

Claessens et al. (2018) argue that smaller banks are at a disadvantage in low-interest rate environments, because of their reliance on traditional lending practices. However, larger banks are able to maintain their profitability due to more diversified revenue streams, and can also be seen as more risk-taking, as they are more involved in trading activities (Bikker & Vervliet, 2018). As a result, smaller banks experience a more pronounced decline in ROA when interest rates remain low for extended periods.

ROA is also effected by myriads of indirect consequences of interest rate changes. Specifically, the inflation of housing prices caused by more available lending has a significant positive effect on ROA (Borio et al., 2017). They also find that while not significant the impact of stock price inflation and GDP growth are positive for ROA, which negate some of the effects when interest rates are reduced. These effects are not enough to negate the negative effects on NIMs (Borio et al., 2017).

While many studies report the negative relationship between interest rates and banks' ROA such as Bikker and Vervliet (2018) and Borio et al. (2017), there are some contradictory evidence. Claessens et al. (2018) do find the same relationship, but much like Altavilla et al. (2018), after considering circumstances such as expected GDP development and expected interest rate fluctuations, they note that the relationship between interest rates and overall profitability isn't statistically significant. Claiming that the negative effects on NIM are almost completely counteracted by the positive effects on NII and LLPs. Another contradicting result is found by Campmas (2020). Finding that when controlling for periods of low interest rates, banks tend to succeed in increasing overall profitability, regardless of the reduction in net interest margins.

While the effects of interest rate changes on ROA are debated during normal times, most of the literature agrees that a low-interest rate environment negatively influences the overall profitability of banks. Nevertheless, the analysis on ROA illustrates how the key components of bank profitability (NIM, NII and LLP) interact under different interest rate conditions. ROA also serves as a key link between bank profitability and stock market valuation, as investors monitor metrics such as ROA when assessing performance and earnings potential. Next the focus will be on risk-taking behavior, which is the other metric used later on valuation in this thesis.

3.2 The effect on risk-taking behavior

Risk-taking behavior is a fundamental part of banking. It determines how banks react to changing financial conditions by expanding credit, allocating assets and managing leverage. Since banks operate as financial intermediaries, their willingness to take risk is shaped by monetary policies, economic conditions and regulatory environments. Having already touched upon risk-taking in the profitability metrics section concerning LLPs, the focus of this section will be on credit standards, bank expansion to foreign markets and alternative revenues.

A key relationship exists between monetary policy easing and bank risk-taking. When interest rates decline borrowers' net worth and credit worthiness improve, resulting in lower loan rates, higher loan quality and higher loan demand (Paligorova & Santos, 2017). Most research finds a negative connection between interest rates and risk-taking, meaning that as short-term interest rates fall, banks tend to increase their risk appetite (Ender & Neuhofer, 2021; Zhang et al., 2024). In addition, banks are observed to require less risk premium for their loans (Paligorova & Santos, 2017). As banks struggle with declining NIMs, they tend to diversify into non-traditional business lines to compensate for their lost revenue. However, this shift often increases overall risk exposure (Chen et al., 2017). Zhang et al. (2024) find that there is a positive connection between the level of monitoring for loans and the interest rate, meaning that a decrease in interest rates also decreases the effort of banks loan screenings, increasing risk-taking significantly. They record that a percentage point decrease in the short-term rate increases bank risk-taking by 0.002 percentage points.

Bank size and ownership structure also play a great role in determining risk preferences. For example, state-owned and foreign owned tend to take more risk compared to their privately owned counterparts, as government backing may encourage riskier lending behavior (Chen et al., 2017). Larger banks with greater access to financial markets can more easily expand into investment banking, trading and structured products, while smaller banks, which are more dependent on interest income, may loosen their credit standards and may also be more incentivized to take on more risk in search for yield (Zhang et al., 2024).

While not apparent initially after short-term interest decreases, in a low- for-long environment, banks are even more inclined to take on additional risk to compensate for lost revenue, since their profitability is eroded (Deutsche Bank, 2013). Evidence from Japanese banks suggest that after years of low rates, banks engaged in aggressive foreign market expansion and riskier loan portfolios in an effort to offset declining domestic

profitability (Deutsche Bank, 2013). These actions heavily increase the systemic risks of banks.

The relationship between low interest rates and risk-taking behavior highlights a trade-off between short-term profitability and long-term stability. While initial credit expansion boosts lending activity (Wang, 2025), prolonged exposure to low rates might increase systemic risk by encouraging riskier lending and asset allocations. This search-for-yield behavior has direct implications for financial stability and profitability, linking risk-taking to broader monetary policy and bank valuation trends. While the policy effects are not in the scope of this thesis, they are touched upon in the conclusion. Next, the focus moves on to the effect of negative interest rates.

3.3 Negative interest rates

Negative interest rate policy (NIRP) is an unconventional tool that central banks use to stimulate economic growth and lending. To push interest rates to the negatives central banks introduce a negative rate on reserves in excess of the minimum reserve, changing the dynamic to charging for holding fund instead of lending (European Central Bank, 2015). Additionally, central banks may lower key policy rates such as deposit facility rates or overnight lending rates, into negative territory encouraging commercial banks to extend more credit. Quantitative easing can also be used to flatten the yield curve, but the combined effect of NIRP and QE are yet to be broadly studied (Heider et al., 2021), and are out of the scope of this paper. Unlike standard rates, negative interest rates introduce unique challenges, but to avoid repetition we will primarily focus on differences in comparison to low rates.

Heider et al. (2021) find that banks in negative interest rate environments experience even greater profitability erosion compared to those in low rates. In the case of NIM the compression is more dramatic. In a typical low rate setting banks can partially offset margin pressures by lowering the deposit rate. However, when rates turn to the negatives,

banks face a hard lower bound, since passing negative interests to depositors could result in withdrawals, a shift to cash holding or a change to a competing bank that hasn't lowered their deposit rate (Heider et al., 2021).

The effect on NII is similar to those during standard policies, but as the effect on NIM is greater so must be the action taken with NII. Because of the substantial effect that NIRP has on NIMs the decline in profitability cannot be replaced by charging higher fees from depositors (Hong & Kandrac, 2021). It needs to be noted that Hong and Kandrac's (2021) study focuses specifically on negative interest rates on Japanese banks, which were exposed to a zero-interest rate policy for decades. So, while their findings are similar to Heider et al. (2021), they need to be taken with a grain of salt. Nevertheless, the increased reliance on NII during NIRP introduces additional volatility. While NII partially offsets lost interest income, it is less stable than traditional lending due to market conditions and client transaction volumes (Chen et al., 2017).

With profitability under pressure, banks may loosen their credit standards to boost lending volumes, creating long-term financial stability concerns. In Germany banks with a deposit heavy balance sheet expanded their lending only to more risky businesses (Heider et al., 2021). Moreover, banks may attempt to compensate declining margins by increasing loan volumes, but because of negative interest rates, loan yields are significantly lower. To compensate for the reduced profitability, loan-durations are extended, but this generates additional risk for the bank, since longer loans are inherently riskier (Hong & Kandrac, 2021). Additionally, based on effects during low interest rate it can be speculated that, banks in times of negative interest rates might also under provision for future credit losses.

Bank size and structure are a driving factor for estimating the hit on bank activity during periods of negative interest rates. Similar effects to those in low-interest rates are recorded where more deposit heavy, typically smaller banks are more exposed to interest

rate changes and are thus more effected than larger, more diversified banks (Heider et al., 2021).

Negative interest rates introduce instinct challenges for profitability and risk-taking beyond those seen in more conventional low-rate environments. The sever compression of NIMs, the greater reliance on NII and the delayed recognition of credit risks create an environment where banks face heightened financial vulnerabilities, especially when the interest rates inevitably return to the positive side. These challenges disproportionately effect banks with deposit heavy balance sheet and smaller banks, while larger banks tend to mitigate the effects with different revenue channels. We can conclude that the effects of negative interest rates are similar to those of low interest rates, but their effects are much stronger requiring more effort from banks to offset them. While not the focus of this paper, understanding the effects of negative interest rates is important to assessing banks' valuation and long-term resilience, which will be explored in the following section.

4 Stock market valuation of banks

The previous chapter established the effects that interest rate hikes have on banks in advanced economies. This chapter gathers the evidence and explores how interest rate changes effect bank valuation in stock markets. This is done by applying valuation models discussed in the theoretical framework to the findings in chapter 3 in the first section (4.1). The second section (4.2) examines the empirical evidence from literature, assessing how stock markets have actually reacted to monetary policy shifts, focusing on bank valuation. It needs to be noted that interest rates changes do not happen in a void, as they are in general correlated with the cyclical nature of economic conditions (English et al., 2018).

4.1 Theoretical perspective on bank valuation and interest rates

Interest rates play a fundamental role in stock valuation, effecting discount rates, risk premiums and investor expectations. Theoretically a decrease in interest rates should raise overall stock prices due to lower discount rates and borrowing costs, while an increase should lead to lower valuations. However, banks are in a unique position, since their main source of income is interest, essentially making money with money.

As established in chapter 3, when interest rates fall, banks increasingly rely on non-interest income, which is inherently more risky and more correlated with the market. This reliance should, in theory, increases the systematic risk of bank stocks, raising their beta (β) (Chen et al., 2017). If applied to the CAP-model an increase in beta should increase the required or expected return of the stock, thereby reducing the stocks market value. However, a lower interest rate environment also means a reduction in the risk-free rate, which in turn has the opposite effect of lowering the required return and increasing stock valuation. The net effect in this case depends on which of these forces dominates, whether the increase in risk outweighs the benefits of lower discount rates. Without conducting primary research, it is, however, difficult to determine. Thankfully, there are

more tools available than just the CAP-model, as it is often used to get the denominator for the DCF model which will be examined next.

Using the DCF-model and adding the expected return, gathered from the CAP-model as the denominator, it is possible to estimate what should happen to the price of the stock. If indeed the increase in the beta outweighs the reduction in the risk-free rate in the denominator, then even without a change in the cash flow component the price of the stock should fall. Considering the empirical evidence from section 3, we can determine that in general the profitability of banks erodes during decreases in the interest rate, especially in the long term. Using the free cash flow model or the FCFE model should yield similar results, since the amount of free cash flow is also reduced. Estimating the immediate and short-term effects becomes much harder, when considering that the reduction in profitability is also somewhat counteracted by the decrease in LLPs, which are directly deducted from the profits. Combining this information with the decrease in cash flow and the possible increase in the discount rate, in theory, the stock valuation of banks should drop.

Lastly, the effect on the P/E model is studied. Leong et al. (2023) find the model to be the theory that tends to most accurately forecast future banks stock prices. Simply put, if the earnings decrease as shown in chapter 3, then the P/E increases if the price stays the same. Investors tend to use the P/E model as a simple tool to assess risk in a stock, for example a P/E of 10, with a stock price of 20€ and an E of 2€, is less risky than a P/E of 20, with a stock price of 20€ and an E of 1€ (Leong et al., 2023). The increase in risk-taking behavior and decrease in loan screening should increase the perceived risk of the stock. Since riskier stocks need to yield higher returns, the stock price should be reduced as discussed earlier.

As found in chapter three, bank size has an amplifying effect when measuring interest rates changes and profitability. Therefore, we can deduce that smaller and more deposit focused banks, should lose even more value, if their profitability indeed is hit harder. The

same can also be said about negative interest rates. When rates turn to the negative the effects should be more pronounced.

The combined effects of increased riskiness and lower profitability should, in theory drive the stock valuation down, but the reduction in the risk-free rate has a counterbalancing effect, lessening the actual impact. With the evidence gathered in previous chapters, the valuation of banks' stock should be reduced, mirroring the effect on profitability and amplified by the increase in riskiness. What these theoretical models don't consider, as stated previously, is the effect of macroeconomic changes and behavioral finance. In addition, using the models in such a rudimentary setting makes it nearly impossible to estimate the effects of market expectations. These theoretical considerations will be contrasted with empirical findings in the next section.

4.2 Empirical evidence

Next, the empirical evidence found regarding bank stock prices are examined and compared with the findings of chapter 4.1. The most important question arising from the previous chapter is, whether the reduction in NIMs and, ergo, profitability does in fact counteract the reduction in the discount rate and the increase in other revenues. However, interpreting falling stock prices during periods of monetary easing is challenging due to other economic factors and investor expectations (Altavilla et al., 2018).

Altavilla et al. (2018) measure the effects of monetary policy easing on bank stock valuation and finds that an easing shock, measured as the short term-rate and the slope of the yield curve, tend to have, contrary to our speculation, a positive impact on bank valuation. Recording that, a 1,5% increase in the median bank stock price from a 10-basis point unexpected decrease in the short-term rate, with near identical results recorded by English et al. (2018). The converse is found when an unexpected increase happens. In the USA, bank stock prices tend to fall with changes to the interest rate or a steepening of the yield curve, with a lessening effect coming from a large maturity gap (Claessens

et al., 2018). Adding to the effect, English et al (2018) find that specifically for the yield curve, a parallel upward shift of 0.25 basis point lowers the average price of a bank stock between 2 and 2.5 basis points. So, it appears that the dominating force is the lower discount factor rather than the compression of profits. However, other macroeconomic factors and behavioral finance can also help explain the phenomena.

However, Chen et al. (2022) find that contrary to regular interest rate periods, bank equity prices tend to decrease during periods of low interest rates when an unexpected monetary easing is announced. They record that during normal times an increase of 1% in the forward rate decreases bank equity returns by 0.94%, whereas during periods of low interest rates an increase of 1% also increases bank equity returns by 0.43%. Conversely a decrease of 1% of the forward rate decreases bank equity returns by 0.22% during low interest rate periods and increases returns by 0.98% during normal times, with the results prevailing even after controlling for the overall market changes (Chen et al., 2022). This is in line with the lower profitability of banks during those periods and suggests that the negative effects on profitability begin to dominate over the lower discounting, if the interest rates remain low-for-long.

Bank size also effects the impact of interest rate changes. Smaller, more deposit reliant banks are more exposed to interest rate risk, and on the other hand interest rate derivatives are used by only a few and relatively large banks (English et al., 2018; Chen et al., 2022). This makes smaller banks more vulnerable to monetary policy fluctuations, increasing its effects on their valuation. Confirming the speculation in the previous chapter. Moreover, the position that banks take on interest rate derivatives also supports the slope of the yield curve, and the short-term rate effect NIMs and trading income in opposite directions (Alessandri & Nelsson, 2015; Bikker & Vervliet, 2018)

An interesting perspective is seen in Japan when negative interest rates were announced. Hong and Kandrac (2021) examined a period of four days when negative interest policy

was announced. They found that while initially the Topix index saw a downward movement it quickly rose back and above the previous threshold. In contrast the Topix bank index lost around 10% of its value. As stated in chapter 3, Japan was in a unique position. Japan had, previous to negative interest rates, had a zero-interest rate policy, with the goal of keeping them as low as possible. The other important factor to consider being that the announcement of the negative interest rate policy came as a major surprise for investors, which led to the sharp adjustment.

The empirical evidence presents a complicated picture on how interest rate changes effect bank stock valuations. While the theoretical expectation is that lower NIMs and ROA should negatively impact stock prices, findings suggest that the dominant force is often the discount rate effect, which can lead to stock price increases during monetary policy easing. However, heterogeneity across banks in terms of size and deposit reliance, creates variation in the outcomes. However, similar to the results found in chapter three, periods of low interest rates severely hinder bank profitability, which is also seen in equity valuations. Additionally, market expectations and investor sentiments play a large role as demonstrated by the effects in Japan, where policy surprises resulted in extreme short-term fluctuations. These findings suggest that the impacts of monetary policy surprises on stock valuation are neither uniform, nor entirely predictable.

5 Conclusion

This thesis examines the effects of interest rate changes on bank profitability and valuation, with a focus on a low-interest rate environment and a brief overlook on negative interests. Moreover, the effects of profitability in this context are applied to valuation models covered in the theoretical framework section. In addition, the theoretical framework includes mechanisms which provide the ground for the thesis.

Many of the studies in the literature review conclude that there is indeed a positive correlation between interest rates and bank profitability, with the extent of the effects being debated. Evidence exclusively from the USA suggests that banks can mostly make up for lost interest margins by increasing profits from non-interest income, while other studies find that banks' profits are reduced during downturns in interest rates. What all the literature agrees on, however, is that prolonged exposure to low and negative interest rates erode bank profitability and that the effects of interest rate changes are pronounced in a low-interest rate environment. A link between bank risk-taking and the interest rate is also found with decreases in the short-term rate increasing bank risk appetite.

The other, shorter, subject of the thesis being valuation, finds evidence contrary to the second hypothesis. When interest rates fall unexpectedly, bank valuation in the stock market tends to rise, while profitability falls during normal times. The explaining factor being the reduction in discount rates, making cash flows more valuable in the future. However, if interest rates remain low for prolonged periods, bank equity valuations become positively correlated with interest rates, mirroring the effect on profitability.

It needs to be noted that while many of the studies are based on cross-country evidence, some of them have a more limited scope, which might be reflected in their results. However, with these findings, we can conclude that hypothesis 1 is confirmed by the research of this paper whereas Hypothesis 2 is somewhat negated during normal times but is correct during periods of low-for-long interest rates.

While policy implications are not the focus of this paper, it should be noted that the increase in risk-taking and lowering of credit monitoring effort during decreases in the interest rate might bring increased defaults when interest rates rise again. Policy makers could introduce new legislations to counteract this, but that might negate the idea of monetary policy easing, which is to encourage spending and stimulate the economy.

A possible way to expand the study is to include more complex valuation models such as different multifactor models, since we discuss the effect of bank size and returns. In addition, a behavioral finance perspective on the effects could be taken. Another avenue could be to more closely study the effect on risk-taking via interviews with bank executives.

Disclaimer: This thesis utilizes AI program ChatGPT for checking grammatical errors, refining language and helping with structuring. All research, analysis and critical thinking were conducted by the author. The final content remains the sole responsibility of the author.

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