



Bank CEO Ownership, Performance and Risk

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Abstract

In this study, I investigate the relationship between the Chief Executive Officer (CEO) ownership and the bank's performance and risk, analysing the interaction between ownership and three measures of performance (stock returns, Return on Equity - ROE and Return on Assets - ROA) and two measures of risk (stock volatility and the ratio of Risk Weighted Assets RWA to Total Assets). I use a sample of a maximum of 47 listed US banks in 2021. Corporate governance of banks gained an increased interest after the financial crisis of 2008-2009, as governments, regulators, companies and academics tried to find good governance practices that could avoid another financial crisis. The principal-agent issue in banks has its own particularities, as banks are special companies due to their systemic risk, the presence of heavy regulation, and other factors that interact together to influence the optimal governance mechanism that would need to be implemented.

One of the classical recommendations of governance is aligning the incentives of managers with the ones of the shareholders through equity ownership, ensuring a positive impact on performance and a prudent risk level for the bank.

In this research, however, I found mixed evidence of this relationship with performance and no evidence with risk. I obtained limited results of a linear interaction with stock returns or ROE. I discovered significant results for a positive quadratic relationship between ownership and stock returns, but not for ROE or ROA. Nevertheless, there is some evidence of a significant, positive and linear influence on ROA.

Keywords: CEO ownership, corporate governance, principal-agent theory, bank performance, bank risk, stock returns, Return on Equity, ROE, Return on Assets, ROA, stock volatility, Risk Weighted Assets, RWA, ratio of RWA to Total Assets, financial crisis

Resumo

No presente estudo, investigarei a relação entre a participação accionista do CEO de um banco e a sua performance e risco, analisando três variáveis de performance (retorno das acções, rentabilidade dos capitais próprios e dos activos – ROE e ROA) e duas medidas de risco (volatilidade mensal das acções, e o rácio de Activos Ponderados por Risco RWA sobre Activos Totais). Utilizarei uma amostra de um máximo de 47 bancos americanos cotados em bolsa, durante 2021.

O governo societário dos bancos ganhou um interesse acrescido após a crise financeira de 2008-2009, quando governos, reguladores, empresas e académicos debatiam quais as boas práticas para evitar outra crise financeira. O problema de agência nos bancos é bastante específico: estes são entidades especiais devido ao seu risco sistémico, sujeitos a uma forte regulação e a outros factores que influenciam o mecanismo de governo. Uma das recomendações clássicas de governo societário é a de alinhar os incentivos dos gestores com os dos accionistas através da participação dos gestores no capital do banco, assegurando um impacto positivo na performance e um prudente nível de risco da instituição financeira.

Contudo, nesta pesquisa, encontrei evidências mistas da relação com a performance e nenhuma evidência da relação com o risco. Obtive resultados limitados de uma interacção linear com o retorno das acções ou ROE. Descubri resultados significativos para uma relação quadrática positiva com o retorno das acções, mas não com o ROE ou ROA. Não obstante, existe alguma evidência de uma relação significativa, positiva e linear com o ROA.

Palavras-chave: participação accionista, governo societário, problema de agência, performance, risco, retorno das acções, rentabilidade dos capitais próprios, ROE, rentabilidade dos activos, ROA, volatilidade das acções, rácio de activos ponderados por risco sobre activos totais, RWA, crise financeira

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Table of Contents

Abstract	ii
Resumo	iii
Acknowledgements	iv
Table of Contents	v
1. Introduction	1
1.1 Background in Portugal	3
2. Literature Review	7
2.1 The present study	11
3. Methodology	12
4. The Sample of Banks	14
5. CEO equity ownership at the end of 2021	15
6. CEO ownership and bank performance	18
6.1 Stock Returns	18
6.2 ROE and ROA	23
7. CEO ownership and bank risk	30
7.1 Monthly Stock Volatility	30
7.2 Ratio of RWA to Total Assets	33
8. Conclusion	36
9. References	37
10. Appendix I	41

1. Introduction

The subprime meltdown in the U.S. that started in 2007 and the dramatic collapse of Lehman Brothers in September 2008 triggered what would become the biggest financial crisis since the Great Depression in 1929, leading to severe losses, bankruptcies and nationalisation of banks all over the world. It would spark the Great Recession in the following years, coupled with the public debt crisis in the Eurozone that threatened to break up the monetary union created in 2000 in Europe.

I had started my career in banking a couple of years before and was now witnessing from the inside one of the biggest convulsions of the financial system, with several high profile cases of bank collapses in which its CEO played a major role. I became interested in analysing the importance of the CEO in banks' performance and risk taking and, in particular, whether the CEO inside ownership could actually have any influence on decision making regarding performance and risk.

The systemic risk of banks quickly impacted the entire sector and the rest of the economy on the last quarter of 2008, prompting central banks and governments to take unprecedented action to secure depositors, control the panic of economic agents and of stock markets, and hold the Eurozone together. The famous "whatever it takes" speech by Mario Draghi in 2012, then president of the European Central Bank (ECB), was a moment of truth that affirmed the unwavering support that the ECB was ready to commit to towards banks and governments in the Eurozone, similarly to what the Federal Reserve had done in the U.S. two years before with chairman Ben Bernanke at the helm, opening a new era of non-conventional monetary policy, quantitative easing and historically low (even negative) interest rates that would last for an entire decade.

A combination of factors were pointed out as the major causes of the financial crisis. As summed up by the then chairwoman of the U.S. Securities and Exchange Commission (SEC), Mary L. Schapiro, on her testimony before the Financial Crisis Inquiry Commission in the U.S. Congress in 2010, these factors included the rise of mortgage securitization and its facilitation of weaker underwriting standards, the excessive trust on credit ratings, a widespread belief in markets' self-balancing capacity and the inadequate assessment of the risks of deregulation, as well as the proliferation of complex financial products like derivatives, whose illiquidity risks and other

characteristics were opaque to many investors and not adequately understood. An insufficient risk management by banks and investors who marketed and purchased complex financial products was also to blame, as well as a compartmented financial regulatory framework that lacked the ability to monitor and reduce risks of the regulated entities and markets. And finally, the “perverse incentives and asymmetric compensation arrangements that encouraged significant risk-taking” – a classic corporate governance issue.

In 2007, the year before the collapse of Lehman Brothers, Lloyd Blankfein, then CEO of Goldman Sachs, received an estimated 70 million dollar payout¹, making him the highest paid CEO in a US bank at the time. Lehman Brothers’ CEO Richard Fuld earned that same year an estimated compensation of 34.38 million dollars², of which nearly 27 million dollars was in stock awards. American International Group Financial Products unit (AIG FP), responsible for the development and widespread use of credit default swaps and complex financial products and part of the world’s biggest insurance company AIG, agreed to pay its CEO, Joseph Cassano, an estimated 34 million dollars in retirement bonuses in March 2008³, just before AIG collapsed and was bailed out by the US government.

Citigroup’s CEO Vikram Pandit received 10.8 million dollars in 2008, when he took over the CEO seat, while his predecessor Charles Prince III had been paid 10.4 million dollars in bonuses before resigning in late 2007.

The disconnection between the CEOs’ compensation and the devastating financial turmoil that followed would soon cause a wave of criticism and outrage from general society. Corporate governance of banks gained an increased attention, with some authors pointing the weak governance as one of the major causes of the crisis (Kirkpatrick, 2009), an argument also voiced by regulators like the US SEC, as previously mentioned.

¹ According to information available in Goldman Sach’s website: <https://www.goldmansachs.com/investor-relations/financials/archived/proxy-statements/docs/2008-proxy-statement.pdf>

² According to information available in the SEC’s website: <https://www.sec.gov/Archives/edgar/data/806085/000104746908002261/a2183244zdef14a.htm>

³ According to news published by Court House News: <https://www.courthousenews.com/ceo-got-43m-after-wrecking-aig-says-class/>

Codes of Conduct for banks were introduced in some countries as an attempt of preventing future critical losses like the ones caused by the financial crisis. For instance, the Netherlands Bankers' Association put forward a Banking Code in January 2010 with a set of guidelines on the composition and expertise of board members, their remuneration, and the assessment of their functioning. "Complementarity, a collegial board, independence and diversity are preconditions for the supervisory board to perform its tasks properly, according to the Code.

Also, the British government commissioned the Walker Review in 2009 that would serve as the basis for the UK Governance Code. The Review included a large chapter dedicated to the remuneration of managers and board members, as a means to improve the effectiveness of risk management at the board level. Surprisingly, there was no mention to an important aspect of the managers' compensation: the equity ownership incentives. Probably realising this omission, this topic was later introduced in 2016 and 2018 in the UK Governance Code, in a short section recommending that remuneration schemes should promote long term shareholdings by executive directors that would be in line with long term shareholders' interests.

1.1 Background in Portugal

The financial crisis would only hit the main Portuguese banks some years later in 2011 but would trigger the uncovering of at least three major cases of CEO-led bank frauds that had been going on for some years under the radar of the regulators in Portugal.

Little exposed to US subprime assets and US banks, the largest Portuguese banks were actually reporting record profits in 2008 and 2009 and were in an apparently good financial situation, reflected in the investment grade ratings they were receiving from the main rating agencies.

However, in 2010, the Portuguese government started to find it difficult to finance its debt in the markets, against soaring credit default spreads and yields. Markets were getting increasingly uncomfortable about the high indebtedness of the Portuguese Republic and feared that Portugal could become the next country in the Eurozone to ask for financial assistance, like Greece and Ireland had done that same year. And that was actually what would happen in April 2011, when the ECB, European Commission and the International Monetary Fund (IMF), together commonly designated as troika, were called to bail out Portugal in a three year financial aid program that included substantial austerity measures which would be imposed on the economy.

As a consequence of this financial turmoil, the rating of the Portuguese Republic was downgraded to high yield or “junk” level (BB+ and Ba2) in July 2011 and soon after all major Portuguese banks’ ratings followed, as these were highly exposed to Portuguese sovereign debt.

There was nevertheless an early side effect of the Lehman Brothers’ collapse in September 2008 and the financial crisis that followed: a small Portuguese bank named BPN – Banco Português de Negócios, which had been in some difficulties since early 2008, was now facing serious constraints in accessing liquidity in the markets and had to make an emergency loan of 200 million euros in October 2008, provided by the state-owned bank Caixa Geral de Depósitos. One month after, the Government announced that it was going to nationalise BPN (the first nationalisation of a bank in Portugal since 1975, the year of a troubled post-Revolution) to avoid any panic in the Portuguese banking system, and after discovering serious evidences of malpractices and fraud by BPN’s top management. José Oliveira e Costa, the CEO of BPN between 1997 and 2008, would be later trialled and found guilty of tax fraud, money laundering, forgery, illegal gains and abuse of credit. He was convicted to 15 years in jail in 2018.⁴

This bailout would cost almost 5 billion euros to the Portuguese government over the following years, even after the re-privatisation of BPN in 2012. And would raise serious questions on corporate governance failures and how banking regulators and auditors in Portugal had not been able to detect malpractices for years.

A second case of fraud would erupt soon after, prompted by the international financial crisis: the Banco Privado Português – BPP, a small Portuguese bank founded in 1996, mainly dedicated to Private Banking, saw Moody’s downgrade its rating to D in November 2008 and suddenly could not access the money market. The bank was owned by several shareholders among whom its CEO and co-founder, João Rendeiro, who directly and indirectly owned 15%, making him the biggest shareholder. Facing serious liquidity issues, BPP had to ask the Portuguese government

⁴ According to the news published by Diário de Notícias and Jornal de Negócios:

<https://www.dn.pt/economia/cronologia-do-caso-bpn-1312958.html>

<https://www.jornaldenegocios.pt/economia/justica/detalhe/pena-de-oliveira-e-costa-agravada-para-15-anos-de-prisao-apos-esquecimento-do-tribunal-->

<https://www.jornaldenegocios.pt/empresas/detalhe/oliveira-e-costa-o-homem-que-gostava-de-comer-sopa-ao-pequeno-almoco>

for an emergency state guarantee to underwrite a 750 million euros loan to be provided by Citigroup. However, the Bank of Portugal refused it and decided to intervene in BPP bank in December, naming a new management and securing a 450 million loan with six major Portuguese banks⁵, through a state guarantee that would later be considered as an illegal aid by the European Commission. The deposits were protected under the Deposit Guarantee Fund which was activated some months later to disburse 102.2 million euros to some of the customers of BPP bank, but several depositors did not receive their money back, as their cash had been invested in financial applications apparently without their knowledge. Further investigations into the bank uncovered evidences of fraud and a pyramidal scheme led by the ex-CEO João Rendeiro, who was later charged with wrongdoing, together with other top managers of the bank. He would be convicted in 2018 to 5 years in prison and required to pay large sums of indemnities, but he managed to escape the authorities and fled to South Africa in December 2021. In a tragic twist of events, he would be captured and imprisoned in a South African jail, ending up committing suicide a few months later while waiting for extradition. As for the BPP bank, after rejecting several recovery and restructuring plans that were presented by the new management but deemed financially inviable, the Bank of Portugal decided to withdraw its banking license in April 2010 and proceed to dissolve and liquidate the bank – a process still ongoing today. More than 6 000 customers were left with 1.6 billion euros of losses⁶. The government would struggle over the years to recover the 450 million euros previously provided in the state-guarantee, and only received 407 million euros until today⁷.

In 2014, when Portugal was successfully coming out of the international financial aid program led by the troika, after years of austerity, economic and social sacrifices, another bank scandal broke – this time, with the third largest Portuguese bank, Banco Espírito Santo (BES), in what

⁵ Based on the news published by Jornal de Negócios, Diário de Notícias and Visão: <https://www.jornaldenegocios.pt/empresas/banca---financas/detalhe/bpp-fim-do-banco-foi-decidido-ha-10-anos>
<https://www.dn.pt/bolsa/cronologia-do-caso-bpp-1304583.html>
<https://www.dn.pt/dinheiro/os-problemas-do-bpp-que-levaram-a-queda-de-rendeiro-14400274.html>
<https://visao.sapo.pt/exame/2019-07-16-quando-os-bancos-ficaram-sem-dinheiro/>

⁶ According to the news reported in Eco: <https://eco.sapo.pt/2022/05/13/seis-mil-reclamam-1-600-milhoes-os-numeros-dos-lesados-do-bpp-2/>

⁷ According to the news published by Dinheiro Vivo: <https://www.dinheirovivo.pt/economia/estado-recuperou-407-milhoes-da-garantia-ao-bpp-falta-reaver-43-milhoes-14825489.html>

would become one of Europe's largest financial failures, leaving investors with an estimated 10 billion euros of losses⁸.

BES was listed in the Portuguese main stock exchange, the PSI 20, and was partially owned by the Espírito Santo family, one of the most powerful Portuguese families also present in several other businesses from insurance to hotels, tourism, healthcare and real estate, with more than 200 companies and 25 000 employees in Europe, Africa and Latin America.

Early in 2014, the bank presented its worst annual losses for 2013, amounting to 500 million euros and reflecting the problems that had been boiling up in the previous years from several fronts: losses in the other non-financial areas of the Group Espírito Santo, the bank's disastrous and opaque operation in Angola, family infights and liquidity issues. The difficulties of the Group had started to become public in 2013 and made access to capital markets more difficult. As the Group urgently needed to refinance 3 billion euros of short term debt, it ended up resorting to the BES bank and its clients in what would later be considered as a major failure of ring fencing between the bank and the non-financial areas of the Group. Funds managed by the Asset Management branch of BES invested heavily in debt securities of companies of the Group (in some cases, up to 80% of their portfolios) and these same securities were also commercialised by the BES bank to retail customers.

In an attempt to address the mounting pressure of regulators and markets, the management of BES decided to launch an increase of the bank's capital. And in June 2014, they raised 1.045 billion euros among shareholders, in what would some months later be considered as one of the worst financial investments in Portugal, as soon after the bank would be resolved. After the capital increase, more problems would again erupt and BES would report its worst results ever, a loss of 3.6 billion euros as a consequence of multiple provisions that it had been forced to take by regulators, having uncovered several hidden debts and exposures. In August, the Bank of Portugal decided to take control of BES: the bank was resolved and split into a good bank – the newly created Novobanco – and a bad bank, which would bear the toxic assets⁹. Shareholders and

⁸ According to The Financial Times: <https://www.ft.com/content/a63a4a56-32c0-11e4-93c6-00144feabdc0>

⁹ According to news published by Jornal de Negócios and Observador:
<https://www.jornaldenegocios.pt/empresas/banca---financas/detalhe/cronologia-queda-do-bes-foi-ha-cinco-anos>
<https://observador.pt/especiais/espírito-santo-cronologia-da-derrocada-de-um-imperio-portugues>

subordinated creditors lost everything. This resolution would cost 8.3 billion of euros to the Portuguese government over the following years¹⁰.

These cases highlight the importance of a good corporate governance in the banking sector, to avoid mismanagement, excessive risk taking, malpractices and frauds that can eventually bring huge costs to taxpayers and governments, and can jeopardize the financial system.

2. Literature Review

Modern banking research has improved our understanding of how banks work, their function in the economy, and their critical role during financial crises. The recent Nobel prize for Economic Sciences was granted to Ben Bernanke, Douglas Diamond and Philip Dybvig, valuing their contribution in laying the foundations of this research in the early 1980's. In particular, they helped clarify how to make banks less vulnerable during a financial crisis. One important finding in their theory is how bank collapses exacerbate financial crises, and therefore, should be avoided.

Banks are different from other non-financial firms in many ways. As highlighted by Haan and Vlahu in their Survey on Corporate Governance of Banks (2013), there are three main characteristics which set banks apart: regulation, the ownership structure of banks and the complexity of their business and structure. Due to their unique role as financial intermediators and motors of the payment system, their bankruptcy has severe impacts in the whole economy, leading to negative externalities and systemic risk which the owners of the bank do not internalise, as indicated by Laeven and Valencia (2012). Governments fear the bankruptcy of large banks, who become 'too big to fail' (Poghosyan and De Haan, 2012)¹¹ and therefore receive an implicit government guarantee, which in turn may create a moral hazard to managers and shareholders of these large banks who might increase their risk-taking.

¹⁰ According to news published by Dinheiro Vivo: <https://www.dinheirovivo.pt/economia/resolucao-do-bes-foi-ha-onos-fatura-vai-em-83-mil-milhoes-de-euros-e-ainda-pode-crescer-15066506.html>

¹¹ While there are studies pointing to some evidence between size and risk level of banks, supporting the "too big to fail" argument, there is also other research finding that actually banks may be "too big to be saved", if governments are fiscally limited and do not have enough resources to bail them out (Demirgüç-Kunt and Huizinga, 2010).

Additionally, as depositors are also a source of funding for banks, this may create incentives for the bank to choose high risk investments whose benefits might go to the bank and whose losses will significantly be borne by the depositors. Depositors may not have a good capacity to monitor banks due to high information asymmetry, as pointed out by Demirgüç-Kunt and Detragiache (2002). Also, there might be too many small depositors, which makes the renegotiation of the deposits with the bank a difficult process (Laeven, 2012). Deposit insurance schemes that were largely implemented to protect depositors may actually give more incentives to banks for a higher risk taking (Merton, 1977), an unintended effect. Also, with this protection, depositors are less motivated to effectively monitor the risk of the bank and less sensitive to asking for the correct risk compensation, as they are protected up until a certain amount. However, this makes these deposits – and therefore, debt for the bank – a cheaper source of funds that bank managers will resort to more often (Mehran et al., 2011). This bias is one of the reasons why financial companies are more leveraged than non-financial ones, as indicated by some studies (Acharya et al., 2009; Laeven, 2012).

As shown by the previous examples, the agency problems of banks are exacerbated by the interaction between regulation (in particular, government guarantees and deposit insurance), ownership structure and the complexity of the bank's business. These may affect the effectiveness of the classical corporate governance mechanisms that are usually used to improve the principal-agent issue. Agency theory indicates that the managers of a company (the agent) may not always act in the best interest of the shareholders (principal) and may actually use the profits of the company in their own benefit (Jensen and Meckling, 1976). The information asymmetries that exist between managers (who have a better knowledge of the firm from the inside) and shareholders (who are outsiders) make it difficult to monitor the managers' behaviour. This is why shareholders need to use several measures to ensure that the managers are acting on their behalf, such as: (i) appointing a board with a certain size and composition to ensure an effective monitoring and advising, (ii) concentrated ownership, (iii) corporate control and (iv) management compensation.

Research about the inside ownership of banks (i.e., CEO and director's ownership) and its impact on the bank's performance and risk taking have generated divergent results.

General principal-agent theory and experts in corporate governance indicate that aligning the CEO's incentives with the long term incentives of bank shareholders through equity holdings would ensure that the performance of the bank would be consistently higher and the risk-taking would be optimal. The widely cited review of Murphy (1999) on managerial compensation confirms this relationship.

Several other studies also have found a positive influence of equity ownership on performance (e.g., Jensen and Murphy, 1990; Mehran, 1992; Yang et al. 2011, Aebi et al. 2012). Also, evidence was found that higher inside ownership contributes to reducing bank risk-taking (Chen et al, 1998; and Lee 2002 – for a sample of 65 US banks over the period of 1987-96).

In the light of these studies, the CEO would behave less like an agent and more like a principal when his/her equity stake is increasing, and this is why many firms set target equity ownership for their top executive officers as one of the main governance mechanisms to motivate CEOs – something also recommended by Governance Codes issued by some governments for the financial sector, like the British Government.

However, other research shows that equity incentives may lead to performance manipulation and earnings management (e.g., Cheng and Warfield, 2005; Cohen et al., 2005; Bergstresser and Philippon, 2006).

Some studies also argue that CEO ownership enables the CEO to influence the Board and reduce its capacity to monitor (Jensen 1993; Hermalin and Weisbach 1998). Following this line, Lasfer (2006) found evidence that high managerial ownership may entrench managers by allowing the CEO to influence several corporate governance factors, like selecting a board that is not independent and is unlikely to effectively monitor the CEO, avoiding the split of roles between the CEO and Chairman, reducing the proportion of non-executive directors, among other factors analysed for a sample of 1583 UK non-financial companies in 1996-97.

A specific research about bank CEO incentives and the credit crisis in 2007-2008 performed by Fahlenbrach and Stultz (2011) has found no evidence that banks with CEOs whose incentives were better aligned with the interests of shareholders performed better – they actually show some evidence that they performed worse. Using a sample of US banks, they concluded that bank

CEOs did not reduce their holdings of shares in anticipation of the crisis or during the crisis, signalling that they did not expect the negative consequences of the actions that they considered good before the crisis. Therefore, they suffered extremely large equity losses in the wake of the crisis. The authors point out several possible explanations for this outcome:

- One version is that CEOs might have strong incentives to focus on the short run instead of the long run, especially if markets are inefficient and put more weight on short-run results, therefore, putting pressure on CEOs to focus on short-run profit maximization.
- However, even if the market is efficient and CEOs have proper incentives to focus on the long-run, CEOs might irrationally focus more on short term cash bonuses than on potential increase of their long term equity stake.

Certainly, there are several other factors conditioning the risk-taking and performance of banks. One of them seems to be the shareholders' structure, as shown by Saunders, Strock, and Travlos (1990), who find evidence for US banks that entities controlled by large shareholders show higher risk taking than banks controlled by managers with small shareholdings.

Also, Laeven and Levine (2009) find similar results when analysing whether a large ownership structure and regulation jointly determine bank risk taking, for a sample of 279 banks across 48 countries in 2001. First, they determine that bank risk taking varies positively with the concentration of ownership: bank risk is generally higher in banks that have large owners. This result is true when conditioning on international differences in bank regulations or when including country fixed effects. Therefore, ignoring the ownership structure provides an incomplete analysis of bank risk taking.

Additionally, they add regulation as an explanatory variable of risk-taking in the banking sector (e.g. capital regulations, deposit insurance policies, and restrictions on bank activities), and conclude there is strong evidence that the relation between bank risk and regulation depends critically on each bank's ownership structure: higher regulation decreases bank risk when the ownership is dispersed but increases it when it has a large controlling shareholder. This might point to owners seeking to compensate for the losses generated from capital regulations and activity restrictions by increasing bank risk and seeking higher returns. Therefore, ignoring bank

ownership structure leads to erroneous conclusions about the impact of bank regulations on risk taking.

2.1 The present study

This research focuses on the CEO, as he or she is the most visible person of the management team and one of the most influential in determining the bank's performance and risk. They were the ones called to answer questions during the memorable and tense hearings of the Inquiry Commission in the US Congress in 2010 and 2019 for the main US banks, in the wake of the financial crisis. And as we dramatically witnessed in Portugal, they also had a critical contribution to the major collapse scandals of Portuguese banks in 2008 and 2014.

It is therefore important to analyse their role in the banks' performance and risk, similarly to what Fahlenbrach and Stultz did in their research of 2011. In the present study, I update the analysis period to the year 2021 and I focus on one incentive and governance measure for US banks: the CEO's equity ownership, as measured by the percentage of shares held.

A complete ownership information on all shareholders would have been a relevant input, however it is not available in the databases used in the present research for the sample of banks that were analysed: I was therefore only able to determine the ownership at CEO level based on data collected manually, as detailed in section 5 - CEO Equity Ownership.

This study proceeds as follows:

First, I explain the methodology used in the present research, detailing in section 3 the independent and dependent variables that I considered, and the regression equations that I estimate.

In section 4, I present the sample of banks used, indicating the criteria of selection, the source databases as well as some attrition issues. I present the main data on the final sample to characterize the selected banks and the different variables used.

I continue in section 5, focusing on my main explanatory variable, the CEO equity ownership in 2021, and detailing how I manually collected the required information and built my database. I characterize the final sample obtained with an analysis of summary statistics and additional considerations that I found.

Next, I investigate in section 6 the relationship between the independent variable and the three bank performance measures that I selected: the buy-and-hold stock returns, the ROE (Return on Equity), and the ROA (Return on Assets). I explain how I calculated these variables, I discuss the main statistics that characterize them and then I run linear and quadratic regressions to assess the results – which are quite divergent. I found limited evidence of a linear relationship with stock returns, if we consider the entire sample of banks, but no evidence for ROE. Running a quadratic regression, there is evidence of a positive exponential relationship between CEO ownership and stock returns. However, this relationship is not supported if we use the ROE or ROA as variable.

In section 7, I analyse two bank risk measures as dependent variables: the stock volatility and the ratio of RWA (Risk Weighted Assets) over Total Assets. I detail how I obtained them, I detail the main summary statistics and then I perform linear and quadratic regressions. However, I found no evidence of a relationship between CEO ownership and the level of bank risk.

I conclude in section 8, presenting my final comments on this study.

3. Methodology

In order to assess the relationship between CEO ownership and banks' performance and risk, I selected three performance measures and two risk indicators.

For the performance variables, I chose three alternative measures: i) Stock Returns, ii) Return on Equity (ROE) and iii) Return on Assets (ROA).

Following Fahlenbrach and Stulz (2011), Beltratti and Stulz, 2012 and Aebi et al., 2012, I used a stock market related measure: the stock returns. They are a buy-and-hold return commonly used to evaluate long-term cross-sectional performance when there are many factors that may influence performance. I calculated the cumulative return in the year 2021, taking into consideration the stock prices of the first trading day of the year and the last trading day, December 31st.

The ROA is a traditional accounting performance measure widely used in several industries and also in banks. Following several studies like Grove et al., 2011; Larcker et al., 2007; Morck, Shleifer, & Vishny, 1988, I selected the ROA as one of the performance measures for banks. In the present research, ROA is calculated as the ratio of income before extraordinary items over the

book value of total assets at the end of 2021. It can indicate how efficiently a bank is using its assets to generate income.

Following Aebi et al., 2012; Yeh et al., 2011, and Westman, 2011, I also used the ROE as another accounting performance measure. It is calculated as the ratio of income before extraordinary items over the book value of total equity at the end of 2021. The ROE is a commonly used gauge of a company's profitability and of how efficiently it is using the shareholders' equity to generate profits.

As for the risk measures, I considered two variables: i) monthly stock volatility and ii) the ratio of RWA over Total Assets, commonly designated as RWA Density.

Resorting to a stock market indicator, the stock volatility is calculated as the standard deviation of stock returns and has also been used in previous studies like Lee (2002). It is a straightforward metric of total risk and market volatility, with the underlying assumption that the majority of return behaviour follows the pattern of a normal distribution. In this type of distribution, individual values are expected to fall 68% of the time within one standard deviation of the mean, above or below. Values are within two standard deviations 95% of the time.

The RWA density is a widely used indicator of the level of riskiness of a bank's assets, and therefore, of the bank's risk profile. It is calculated as the ratio of RWA to the booking value of Total Assets. Typically, a high proportion of RWA would indicate a higher share of riskier assets – therefore, a high RWA density would signal a riskier bank¹². It is a measure commonly used by supervisors, for example, to assess the risk of regulated banks.

However, there has been some criticism regarding this indicator (Le Leslé and Avramova, 2012; Ledo, 2011), with some authors considering that actually higher RWA density is more reliable and reflects a more prudent risk management, as banks are less likely to “optimize” and manipulate the calculation of their risk-based capital ratios. Also, there are some concerns regarding the variations in the calculation of risk-weighted assets across banks and jurisdictions, which may compromise the Basel III capital adequacy framework.

¹² For example, Kamal Kishore (2018) offers an interesting study on public and private Indian banks, using the RWA Density as a parameter of risk profile of bank assets. He finds that “an increase in RWA density over a period shows that overall risk profile of bank assets has deteriorated. This may arise due to asset with higher risk weight substituting lower risk assets, without any change in risk weight factors. Similarly, a decrease in RWA density of bank would indicate that risk quality of assets has improved.”

I will run five linear regressions on dependent variables of performance and risk, to estimate the following equation:

$$y_i = \alpha + \beta_i x + \varepsilon_i$$

where x = CEO Ownership in % of shares, and the five dependent variables are :

y_1 = Yearly stock returns

y_2 = Return on Equity (ROE)

y_3 = Return on Assets (ROA)

y_4 = Monthly stock volatility

y_5 = Risk Weighted Assets / Total Assets

for the period of 2021. I will therefore analyse three performance measures and two risk variables.

In some situations, I will also estimate a quadratic regression, where I introduce a second independent variable by calculating the square of the CEO ownership, to estimate the following equation:

$$y_i = \alpha + \beta_{1,i}x_1 + \beta_{2,i}x_2 + \varepsilon_i$$

Where x_1 = CEO Ownership and $x_2 = (x_1)^2 = (\text{CEO Ownership})^2$

4. The Sample of Banks

In order to obtain available data on performance, risk and ownership, I decided to focus only on US publicly traded banks with data in 2021.

I started by obtaining stock prices for the year 2021, from the Centre for Research in Security Prices (CRSP), from Wharton Research Data Services (WRDS), restricting my sample to banks with Standard Industry Classification (SIC) Code 6021 for Commercial Banks and Share Code 11 for Ordinary Common Shares, therefore excluding ADRs, companies incorporated outside the US and other share types.

I initially retrieved 56 banks. However, some of them stopped presenting stock prices during 2021, as they were merged with other banks or delisted. Hence, I excluded them from my sample, which was reduced to 48 banks.

As detailed in the next sections, the need to remove outliers from the sample to ensure that the linear regressions that I performed would be more adequate, and also the unavailability of data for some variables, led to a further attrition of the sample to 47 and in some cases 46 and 45 banks, as shown in detail in Tables 1 and 2.

Table 1: Attrition of banks in the sample

Event	Number of observations	Frequency
Remaining in the sample	47	84%
Merged, acquired or delisted	8	14%
Outliers	1	2%
TOTAL	56	100%

Table 2: Summary statistics of the sample of banks for the year 2021

Variable	Observ.	Standard Deviation	Mean	Minimum	Maximum	Median
CEO Ownership %	47	0.515	0.524	0	1.922	0.325
Stock Return %	46	17.798	36.037	0.416	77.579	34.451
ROE %	46	3.136	11.674	5.983	18.641	11.735
ROA %	46	0.271	1.156	0.53	1.61	1.176
Stock volatility %	45	2.469	3.554	0.207	10.470	3.161
RWA to Total Assets %	47	13.033	70.491	41.346	101.733	71.151
Total Assets (\$ millions)	47	806.353	281.413	0.936	3743.567	9.545

5. CEO equity ownership at the end of 2021

The percentage of shares of the bank owned by the CEO is the main explanatory variable in this research. However, this data was more challenging to obtain, as I did not have access to Execucomp – Compustat (WRDS), BoardEx or other relevant databases on compensation and incentives. I therefore had to compile the data manually.

I started by going to the website of each of the 48 banks selected in the previous section to identify the name of its CEO in 2021, and compile them on my manual database. One curious fact: I found only one woman CEO, which represents a meagre 2% of the total CEO sample. Jane Fraser was appointed in September 2020 as the CEO of Citi Group and was the first woman to

helm one of Wall Street's four major banks. This lack of female representation would be an interesting topic for another dissertation.

To get the data on CEO ownership, I resorted to the Security and Exchange Commission's (SEC) website, namely to the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR). The SEC implemented in 2006 new disclosure requirements for companies, including the need to disclose executive compensation, among others. This was intended to provide investors with clearer information on the compensation of executive officers. Since then, and under Section 16 rules, companies have to fill in Form 3 to identify the holdings of directors, officers and beneficial owners¹³ of registered companies (the insiders), and Form 4 to report all purchase or sales transactions of the insiders.

I manually searched for Forms 3 and 4 in SEC's EDGAR website and found the mandatory filings for shareholdings of officers and directors under Section 16, for each CEO of my sample. I then compiled my data set. I considered both the direct and indirect ownership (where indirect refers to ownership of relatives like spouse or children) to obtain the total number of shares owned by the CEO. I focused only on direct share ownership at the end of 2021, excluding the stock options holdings.

To get the percentage of ownership, I downloaded in Compustat (WRDS) the number of shares outstanding at 31.12.2021 for all US banks with SIC Code 6021, confirming the number of 48 banks previously obtained for my sample. Then I divided the total number of shares owned by the CEO by the number of shares outstanding.

The final result of this ownership is shown on the following Table 3, sorted by bank size, from largest to smallest, in total assets at the end of 2021 (Total Assets taken from Worldscope – Datastream). Appendix I presents more detail on this dataset.

¹³ For beneficial owners who are not directors or officers, the disclosure is only mandatory for holdings higher than 10% of the shares of the company

Table 3: CEO ownership of listed US Banks in 2021, in %

#	Bank	Total Assets (USD Mios)	CEO in 2021	% Shares owned by the CEO
1	JPMORGAN CHASE & CO	3,743,567	Jamie Dimon	0.29%
2	BANK OF AMERICA CORP	3,169,495	Brian Moynihan	0.02%
3	CITIGROUP INC	2,291,413	Jane Fraser	0.01%
4	WELLS FARGO & CO NEW	1,948,068	Charles W. Scharf	0.01%
5	U S BANCORP DEL	573,284	Andrew Cecere	0.06%
6	P N C FINANCIAL SERVICES GRP	557,191	William S. Demchak	0.10%
7	KEYCORP NEW	186,346	Christopher M. Gorman	0.08%
8	SYNCHRONY FINANCIAL	95,748	Brian D. Doubles	0.00%
9	COMERICA INC	94,616	Curtis C. Farmer	0.12%
10	ZIONS BANCORPORATION N A	93,200	A. Scott Anderson	0.02%
11	FIRST HORIZON CORP	89,092	D Bryan Jordan	0.25%
12	VALLEY NATIONAL BANCORP	43,446	Ira Robbins	0.07%
13	PACWEST BANCORP DE	40,443	Matthew P. Wagner	0.98%
14	F N B CORP PA	39,513	Vincent J. Delie	0.27%
15	PINNACLE FINANCIAL PARTNEF	38,469	M. Terry Turner	0.27%
16	WEBSTER FINANCIAL CORP	34,916	John R. Ciulla	0.15%
17	TEXAS CAPITAL BANCSHARES I	34,732	Rob C. Holmes	0.52%
18	STERLING BANCORP DEL	29,659	Jack L. Kopnisky	0.33%
19	OLD NATIONAL BANCORP	24,454	James C. Ryan III	0.22%
20	HOPE BANCORP INC	17,889	Kevin S. Kim	0.53%
21	COMMUNITY BANK SYSTEM INC	15,553	Mark E. Tryniski	0.33%
22	DIME COMMUNITY BANCSHRS I	12,066	Kevin O'Connor	0.00%
23	SEACOAST BANKING CORP	9,681	Charles (Chuck) Shaffer	0.16%
24	PARK NATIONAL CORP	9,560	David L. Trautman	0.42%
25	FIRST COMMONWEALTH FINAN	9,545	Thomas Michael Price	0.31%
26	BANC OF CALIFORNIA INC	9,394	Jared M Wolff	0.40%
27	CONNECTONE BANCORP INC NE	8,129	Frank Sorrentino III	1.92%
28	NICOLET BANKSHARES INC	7,695	Michael E. Daniels	0.54%
29	HORIZON BANCORP INC	7,375	Craig M. Dwight	1.02%
30	NATIONAL BANK HOLDINGS CO	7,214	G Timothy Laney	1.09%
31	TRUSTCO BANK CORP NY	6,197	Robert J. McCormick	1.70%
32	FIRST BANCSHARES INC MS	6,077	Milton Ray Cole Jr.	0.40%
33	CAMDEN NATIONAL CORP	5,500	Gregory A. Dufour	0.73%
34	MID PENN BANCORP INC	4,689	Rory G. Ritrievi	0.28%
35	SUMMIT FINANCIAL GROUP INC	3,577	H. Charles Maddy	0.85%
36	FIRST COMMUNITY BANCSHARI	3,195	William P. Stafford, II	1.24%
37	SOUTHERN FIRST BANCSHARES	2,926	R. Arthur "Art" Seaver, Jr	0.88%
38	FIRST BUSINESS FINL SVCS INC	2,653	Corey Chambas	1.67%
39	FIRST BANCORP INC ME	2,527	Tony C. McKim	0.98%
40	EVANS BANCORP INC	2,211	David J. Nasca	1.56%
41	AMES NATL CORP	2,137	John Patreik Nelson	0.13%
42	L C N B CORP	1,904	Eric J. Meilstrup	0.14%
43	HAWTHORN BANCSHARES INC	1,832	David T. Turner	1.31%
44	NATIONAL BANKSHARES INC	1,702	F. Brad Denardo	0.54%
45	FIRST COMMUNITY CORP SC	1,585	Michael C Crapps	1.04%
46	AMERISERV FINANCIAL INC	1,336	Jeffrey A. Stopko	0.57%
47	UNITED BANCSHARES INC *	1,077	Richard M. Adams Sr.	26.35%
48	PATRIOT NATIONAL BANCORP I	948	Robert G. Russell, Jr.	0.13%

*outlier to be excluded

There is a clear outlier in the sample: the CEO of United Bancshares, who has 26.35% of ownership. Given the large difference, we will exclude this information from the dataset, reducing the number of banks to 47.

As shown in Table 2, we can see that the minimum value obtained was 0% of ownership for one bank (Synchrony Financial), and a maximum of 1.92% for Connectone Bancorp. The mean value was 0.524%, while half of the banks in my sample presents a CEO ownership lower than 0.325% (median) in 2021. The standard deviation is around 0.515 percentage points, which indicates a rather low dispersion of values.

We do not seem to find a pattern of CEO ownership with regards to the size of the bank: while it is true that the largest banks show a low CEO ownership in percentage, we do not observe a consistent increase in the latter for smaller banks. In fact, we also have lower sized banks with a small percentage of CEO ownership, like Patriot National Bancorp, LCNB and Ames National.

These ownership percentages seem quite small, but can be consistent with the fact that I selected only publicly traded companies in the US. Also, if we are talking about a large cap bank, even a small ownership percentage can represent a large amount in absolute terms. For example, Jamie Dimon, the CEO of JP Morgan Chase, holds only 0.29% of shares, but in absolute value, it represents a high amount of approximately 1.345 billion dollars¹⁴.

6. CEO ownership and bank performance

In this section, I investigate the relationship between the CEO ownership and three performance measures of the bank: the stock returns in 2021, the ROE – Return on Equity, and the ROA – Return on Assets.

6.1 Stock Returns

The first measure I considered was a buy-and-hold return, as this is a commonly used approach to evaluate long-term cross-sectional performance when there are many factors that may influence performance. I therefore used the stock returns for 2021, calculated from the stock prices taken from CRSP and as described in Section 4 – The Sample of Banks.

¹⁴ Assuming the closing price of 158.35 USD on 31.12.2021 for JP Morgan shares

For my sample, I considered the first trading day of 2021 and the last trading day of December 31st 2021. Most banks started to trade on January 4th, with the exception of Dime Community Bancshares Inc, with starting date on Feb 1st after the merger with Bridge Bancorp.

As it can be seen in Table 4, there is a clear outlier in my sample: Trustco Bank Corp NY shows an abnormal cumulative return of 401.66% which I decided to exclude from the dataset, in order not to skew the results of the linear regression that I performed afterwards. My sample was then reduced to 46 banks, with a minimum return of 0.416% and a maximum of 77.579%. As shown in Table 2, the average return in 2021 was 36.037%, and the median was 34.451%. These values are in line with the US Banking Sector's performance in 2021: for example, the Dow Jones US Banks Index shows an annual return of 34.49%¹⁵, indicating that 2021 was a rather positive year for US banks' stock performance, after the initial shock waves of the pandemic in March 2020.

However, the standard deviation of the yearly returns of my sample is quite high (17.798 percentage points), which shows the relatively disparity in stock returns across these 46 commercial banks in the US. This disparity is also present in the largest banks, which show different stock returns ranging from 61.55% for Wells Fargo (well above the average) to a more modest 25.80% for JP Morgan Chase and the lowest return of 0.416% for Citigroup.

I then ran a simple linear regression, to estimate the following relationship:

$$y_1 = \alpha + \beta_1 x + \varepsilon_1$$

where x = CEO Ownership and y_1 = yearly stock returns in 2021

The first results are statistically significant only for a level of 10%, as per Table 5. We can also visualise in Figure 1 the relatively high dispersion of most dots around the linear prediction line.

Unlike what we might have expected according to the general theory, there seems to be no strong evidence supporting the classical argument of incentives alignment in which there would be a positive relationship between the CEO ownership and the performance of the company. At least, not in a linear way for all values of ownership.

¹⁵ According to the S&P Dow Jones Indices website: <https://www.spglobal.com/spdji/en/indices/equity/dow-jones-us-banks-index/#overview>

Table 4: Stock Returns in 2021 for listed US banks

#	Bank	Total Assets (\$ mios)	Stock Return in 2021
1	JPMORGAN CHASE & CO	3,743,567	25.80%
2	BANK OF AMERICA CORP	3,169,495	48.15%
3	CITIGROUP INC	2,291,413	0.42%
4	WELLS FARGO & CO NEW	1,948,068	61.55%
5	U S BANCORP DEL	573,284	21.79%
6	P N C FINANCIAL SERVICES GRP INC	557,191	34.44%
7	KEYCORP NEW	186,346	41.99%
8	SYNCHRONY FINANCIAL	95,748	35.88%
9	COMERICA INC	94,616	56.76%
10	ZIONS BANCORPORATION N A	93,200	47.12%
11	FIRST HORIZON CORP	89,092	27.18%
12	VALLEY NATIONAL BANCORP	43,446	41.17%
13	PACWEST BANCORP DE	40,443	76.10%
14	F N B CORP PA	39,513	28.36%
15	PINNACLE FINANCIAL PARTNERS INC	38,469	50.44%
16	WEBSTER FINANCIAL CORP	34,916	33.17%
17	TEXAS CAPITAL BANCSHARES INC	34,732	2.68%
18	STERLING BANCORP DEL	29,659	44.64%
19	OLD NATIONAL BANCORP	24,454	9.42%
20	HOPE BANCORP INC	17,889	34.46%
21	COMMUNITY BANK SYSTEM INC	15,553	20.07%
22	DIME COMMUNITY BANCSHRS INC NEW	12,066	38.37%
23	SEACOAST BANKING CORP FLA	9,681	21.32%
24	PARK NATIONAL CORP	9,560	30.78%
25	FIRST COMMONWEALTH FINANCIAL COR	9,545	47.89%
26	BANC OF CALIFORNIA INC	9,394	30.71%
27	CONNECTONE BANCORP INC NEW	8,129	66.63%
28	NICOLET BANKSHARES INC	7,695	27.09%
29	HORIZON BANCORP INC	7,375	35.13%
30	NATIONAL BANK HOLDINGS CORP	7,214	34.58%
31	TRUSTCO BANK CORP NY *	6,197	401.66%
32	FIRST BANCSHARES INC MS	6,077	26.83%
33	CAMDEN NATIONAL CORP	5,500	33.93%
34	MID PENN BANCORP INC	4,689	46.07%
35	SUMMIT FINANCIAL GROUP INC	3,577	25.92%
36	FIRST COMMUNITY BANCSHARES INC	3,195	56.17%
37	SOUTHERN FIRST BANCSHARES INC	2,926	77.58%
38	FIRST BUSINESS FINL SVCS INC	2,653	60.01%
39	FIRST BANCORP INC ME	2,527	21.42%
40	EVANS BANCORP INC	2,211	46.87%
41	AMES NATL CORP	2,137	5.06%
42	L C N B CORP	1,904	36.86%
43	HAWTHORN BANCSHARES INC	1,832	21.78%
44	NATIONAL BANKSHARES INC	1,702	15.61%
45	FIRST COMMUNITY CORP SC	1,585	25.30%
46	AMERISERV FINANCIAL INC	1,336	24.52%
47	PATRIOT NATIONAL BANCORP INC	948	59.65%

* *Outlier to be excluded*

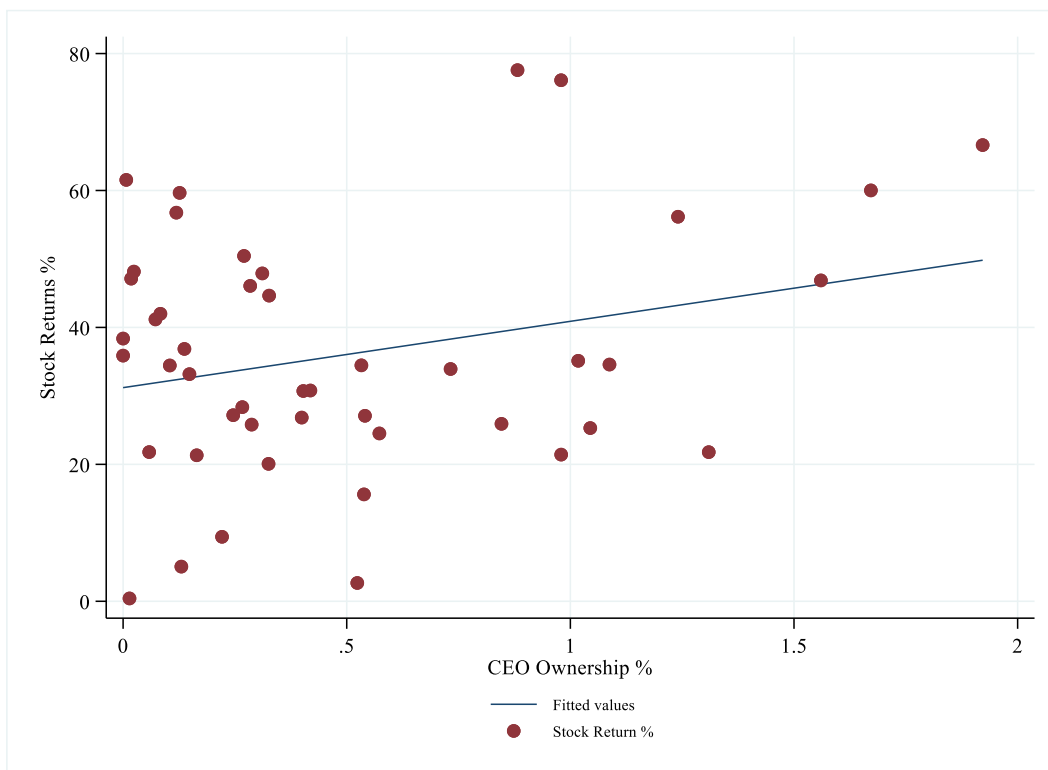
Table 5: Linear regression results for stock returns and CEO ownership in 2021

Stock Return	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	9.682	5.137	1.88	.066	-.67 20.034	*
Constant	31.206	3.558	8.77	0	24.036 38.377	***

Mean dependent var.	36.037	SD dependent var.	17.798
R-squared	0.071	Number of obs.	46
F-test	3.553	Prob > F	0.066
Akaike crit. (AIC)	395.010	Bayesian crit. (BIC)	398.667

Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$

Figure 1: Linear regression for stock returns and CEO ownership in 2021



However, if we restrict the analysis to an ownership above 0.5%, we obtain significant results at a level of 1% for a positive coefficient of 27.887, although with a reduced sample of only 18 banks, as shown in Table 6. This seems to suggest that the linear relationship between CEO ownership and bank performance only holds for ownerships higher than a certain level, in this case, for 0.5%. And is not significant when the CEO has a lower ownership.

Table 6: Linear regression results for stock returns and CEO ownership above 0.5%, in 2021

Stock Return	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	27.887	5.965	4.68	0	15.243	40.531 ***
Constant	10.241	8.191	1.25	.229	-7.122	27.604
Mean dependent var		38.098	SD dependent var.			21.248
R-squared		0.298	Number of obs.			18
F-test		21.860	Prob > F			0.000
Akaike crit. (AIC)		157.711	Bayesian crit. (BIC)			159.492

*Statistical significance for levels *** $p < .01$, ** $p < .05$, * $p < .1$*

We seem to obtain more solid results if we run a quadratic regression on the entire sample, estimating the following equation:

$$y_1 = \alpha + \beta_1 x + \beta_2 x^2 + \varepsilon_1$$

where x = CEO Ownership and y_1 = Stock returns

Table 7: Quadratic regression results for stock returns and CEO ownership in 2021

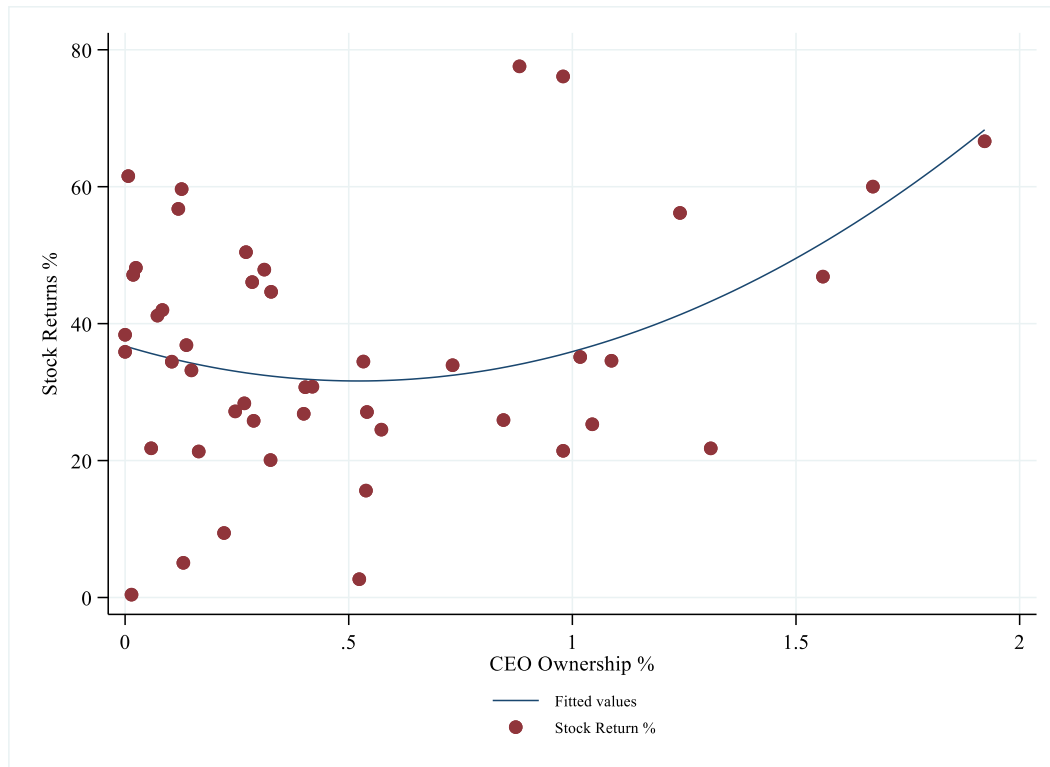
Stock Return	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	-19.52	16.909	-1.15	.255	-53.62	14.581
CEO Ownership ²	18.712	8.487	2.20	.033	1.596	35.829 **
Constant	36.716	4.795	7.66	0	27.047	46.386 ***
Mean dependent var.		36.037	SD dependent var.			17.798
R-squared		0.146	Number of obs.			46
F-test		20.371	Prob > F			0.000
Akaike crit. (AIC)		393.151	Bayesian crit. (BIC)			398.637

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

As we can see from Table 7, our second independent variable (the square value of the CEO ownership) seems to explain more adequately the behaviour of stock returns: we obtained a positive coefficient of 18.712 which is statistically significant for a 5% level, hinting that the relationship with performance may accelerate exponentially with the increasing percentage of CEO ownership. The first independent variable is not statistically significant in this regression.

Furthermore, we can observe on Figure 2 that the quadratic prediction line seems better fitted for stock returns, especially if ownership values are higher than a certain level.

Figure 2: Quadratic regression for stock returns and CEO ownership in 2021



6.2 ROE and ROA

Additionally, I considered other measures of bank performance, in order to assess if the evidence on the relationship with CEO ownership would be stronger or equally significant.

I calculated the Return on Equity (ROE) and Return on Assets (ROA) for each of the 47 banks, obtaining the following data from Compustat – North America – Fundamentals Annual: Income Before Extraordinary Items (IB), Total Common/Ordinary Equity (CEQ) and Total Assets.

I then calculated the ratios of ROE and ROA, as shown in Table 8.

Table 8: ROA and ROE ratios for the sample of banks in 2021

#	Bank	Total Assets (\$ Mios)	ROE	ROA
1	JPMorgan Chase & Co	3,743,567	18.64%	1.29%
2	Bank of America Corp	3,169,495	13.03%	1.01%
3	Citigroup	2,291,413	11.99%	0.96%
4	Wells Fargo & Co	1,948,068	12.81%	1.11%
5	U.S. Bancorp	573,284	16.40%	1.39%
6	The PNC Financial Services Group Inc	557,191	11.19%	1.02%
7	KeyCorp	186,346	16.83%	1.40%
8	<i>Synchrony Financial *</i>	<i>95,748</i>	<i>32.67%</i>	<i>4.41%</i>
9	Comerica Incorporated	94,616	15.57%	1.23%
10	Zions Bancorporation National Association	93,200	16.08%	1.21%
11	First Horizon Corp	89,092	13.01%	1.12%
12	Valley National Bancorp	43,446	9.72%	1.09%
13	PacWest Bancorp	40,443	15.18%	1.50%
14	F.N.B. Corp	39,513	8.02%	1.02%
15	Pinnacle Financial Partners Inc	38,469	10.35%	1.37%
16	Webster Financial Corp	34,916	12.42%	1.17%
17	Texas Capital Bancshares Inc	34,732	8.73%	0.73%
18	Sterling Bancorp	29,659	8.53%	1.36%
19	Old National Bancorp	24,454	9.21%	1.13%
20	Hope Bancorp Inc	17,889	9.77%	1.14%
21	Community Bank System Inc.	15,553	9.03%	1.22%
22	Dime Community Bancshares Inc	12,066	9.66%	0.86%
23	Seacoast Banking Corp of Florida	9,681	9.49%	1.28%
24	Park National Corp	9,560	13.86%	1.61%
25	First Commonwealth Financial Corp.	9,545	12.46%	1.45%
26	Banc of California Inc	9,394	6.43%	0.66%
27	ConnectOne Bancorp Inc	8,129	12.86%	1.60%
28	Nicolet Bankshares Inc	7,695	6.80%	0.79%
29	Horizon Bancorp Inc	7,375	12.04%	1.18%
30	National Bank Holdings Corp	7,214	11.14%	1.30%
31	TrustCo Bank Corp NY	6,197	10.23%	0.99%
32	First Bancshares Inc (The)/MS	6,077	9.49%	1.06%
33	Camden National Corp	5,500	12.75%	1.25%
34	Mid Penn Bancorp Inc	4,689	5.98%	0.63%
35	Summit Financial Group Inc	3,577	14.63%	1.28%
36	First Community Bancshares Inc	3,195	11.96%	1.60%
37	Southern First Bankshares Inc	2,926	16.81%	1.60%
38	First Business Financial Services Inc	2,653	15.38%	1.35%
39	First Bancorp Inc/ME (The)	2,527	14.76%	1.44%
40	Evans Bancorp Inc	2,211	13.07%	1.09%
41	Ames National Corp	2,137	11.51%	1.12%
42	LCNB Corp	1,904	8.79%	1.10%
43	Hawthorn Bancshares Inc	1,832	15.12%	1.23%
44	National Bankshares Inc	1,702	10.63%	1.20%
45	First Community Corp	1,585	10.97%	0.98%
46	AmeriServ Financial Inc	1,336	6.07%	0.53%
47	Patriot National Bancorp Inc	948	7.56%	0.54%

* outlier to be excluded

We can see an outlier in the abnormal ROE of 32.67% and ROA of 4.41% for Synchrony Financial, which I excluded from the dataset for the linear regression that I performed next, in order not to skew the results. My sample was therefore reduced to 46 banks.

The summary statistics are presented in Table 2. For ROE, we can observe a rather significant dispersion of values across the 46 banks of my sample: we obtained a minimum value of 5.98% and a maximum value of 18.64%, while the mean is around 11.67% and the standard deviation is 3.14 percentage points. Half of the sample has a ROE below 11.74% (median). It's interesting to observe that the 4 major banks show a ROE that is higher than the average, and that the largest bank by assets (JP Morgan Chase) has also the maximum ROE (after excluding the abnormal result of 32.67% for Synchrony Financial).

As for the ROA, we can observe more concentrated values around the average of 1.16%: a minimum ROA of 0.53%, a maximum of 1.61%, while the standard deviation is 0.27% and the median is 1.18%.

Performing a linear regression on the ROE, we obtained a positive but non-significant coefficient, which actually is reflected in Figure 3 with rather dispersed dots.

Table 9: Linear regression results for ROE and CEO ownership, in 2021

ROE	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	1.048	.701	1.50	.142	-.364 2.46	
Constant	11.112	.684	16.25	0	9.734 12.491	***
Mean dependent var.		11.674	SD dependent var.		3.136	
R-squared		0.030	Number of obs.		46	
F-test		2.237	Prob > F		0.142	
Akaike crit. (AIC)		237.289	Bayesian crit. (BIC)		240.946	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

The results are not improved with a quadratic regression either, as per Table 10. We again do not find evidence of a positive relationship between the CEO ownership and the performance of the bank, if we consider all levels of ownership. This is not surprising and has actually been the conclusion of previous studies (Fahlenbrach and Stulz, 2011).

Figure 3: Linear regression for ROE and CEO ownership, in 2021

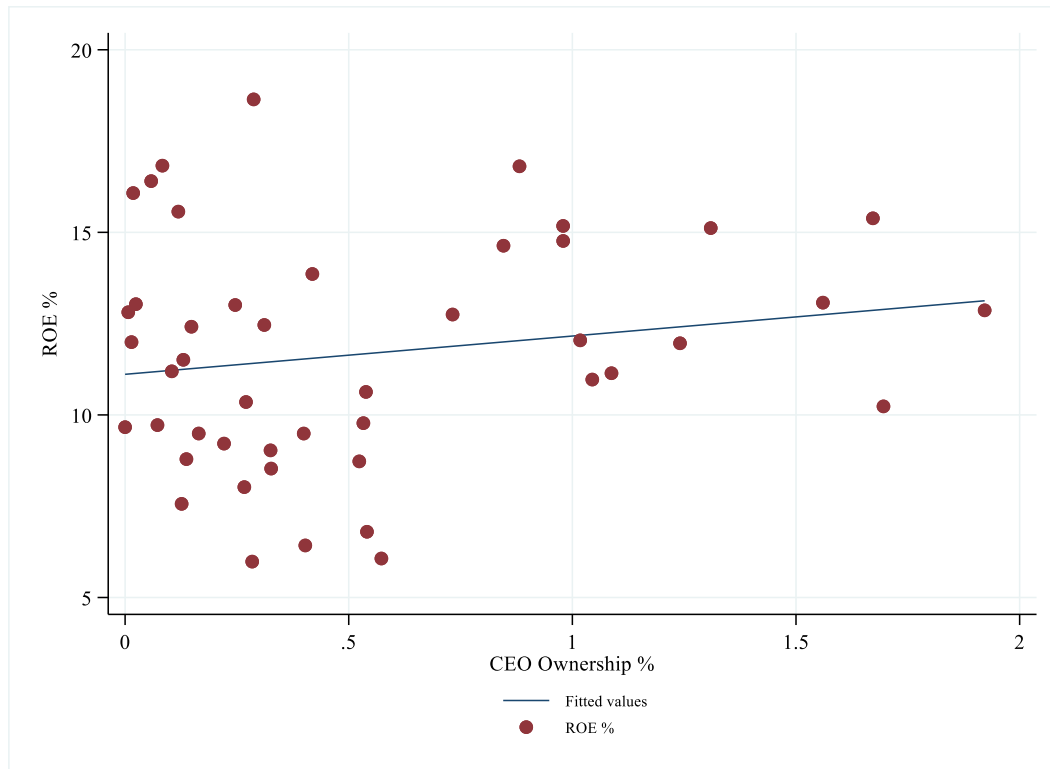
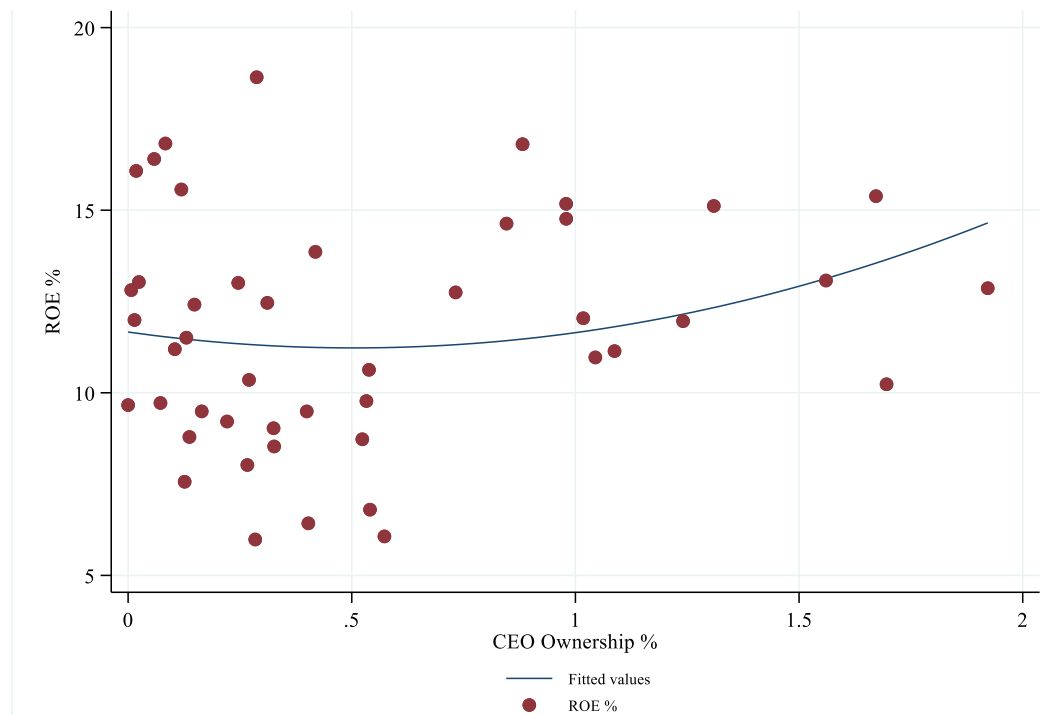


Table 10: Quadratic regression results for ROE and CEO ownership, in 2021

ROE	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	-1.723	2.77	-0.62	.537	-7.309 3.863	
CEO Ownership ²	1.706	1.57	1.09	.283	-1.46 4.872	
Constant	11.665	.842	13.85	0	9.967 13.363	***
Mean dependent var.		11.674	SD dependent var.		3.136	
R-squared		0.051	Number of obs.		46	
F-test		1.867	Prob > F		0.167	
Akaike crit. (AIC)		238.287	Bayesian crit. (BIC)		243.773	

*Statistical significance for a level of *** $p < .01$, ** $p < .05$, * $p < .1$*

Figure 4: Quadratic regression for ROE and CEO ownership, in 2021



If we only consider CEOs with more than 0.5% ownership, we obtain better results both for the linear and the quadratic regression, as per Tables 11 and 12. On the linear regression, the coefficient is positive and significant for a level of 5%. On the quadric one, the first coefficient is positive and statistically significant at 1% level, whereas the second coefficient is negative and significant at 5% level. However, the sample is highly reduced to only 19 banks. This last evidence seems to contradict of first findings of a positive exponential relationship between another performance measure (stock returns) and CEO ownership, which is based on a larger sample of 46 banks.

Table 11: Linear regression results for ROE and CEO ownership above 0.5%, in 2021

ROE	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	2.971	1.407	2.11	.05	.003	5.939 **
Constant	8.971	1.709	5.25	0	5.366	12.577 ***
Mean dependent var.		12.048	SD dependent var.		2.944	
R-squared		0.192	Number of obs.		19	
F-test		4.462	Prob > F		0.050	
Akaike crit. (AIC)		93.871	Bayesian crit. (BIC)		95.760	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

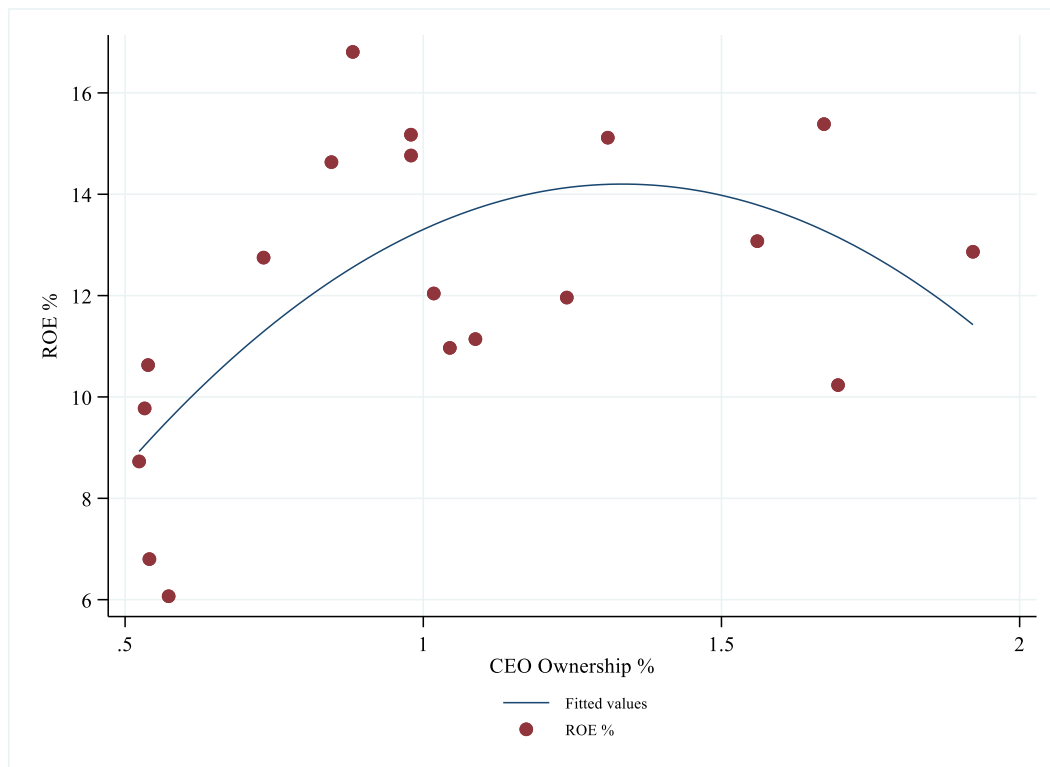
Table 12: Quadratic regression results for ROE and CEO ownership above 0.5%, in 2021

ROE	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	21.432	6.379	3.36	.004	7.909 34.955	***
CEO Ownership^2	-8.033	2.755	-2.92	.01	-13.873 -2.194	**
Constant	-.094	3.251	-0.03	.977	-6.986 6.797	

Mean dependent var.	12.048	SD dependent var.	2.944
R-squared	0.432	Number of obs.	19
F-test	7.937	Prob > F	0.004
Akaike crit. (AIC)	89.181	Bayesian crit. (BIC)	92.014

Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$

Figure 5: Quadratic regression for ROE and CEO ownership above 0.5%, in 2021



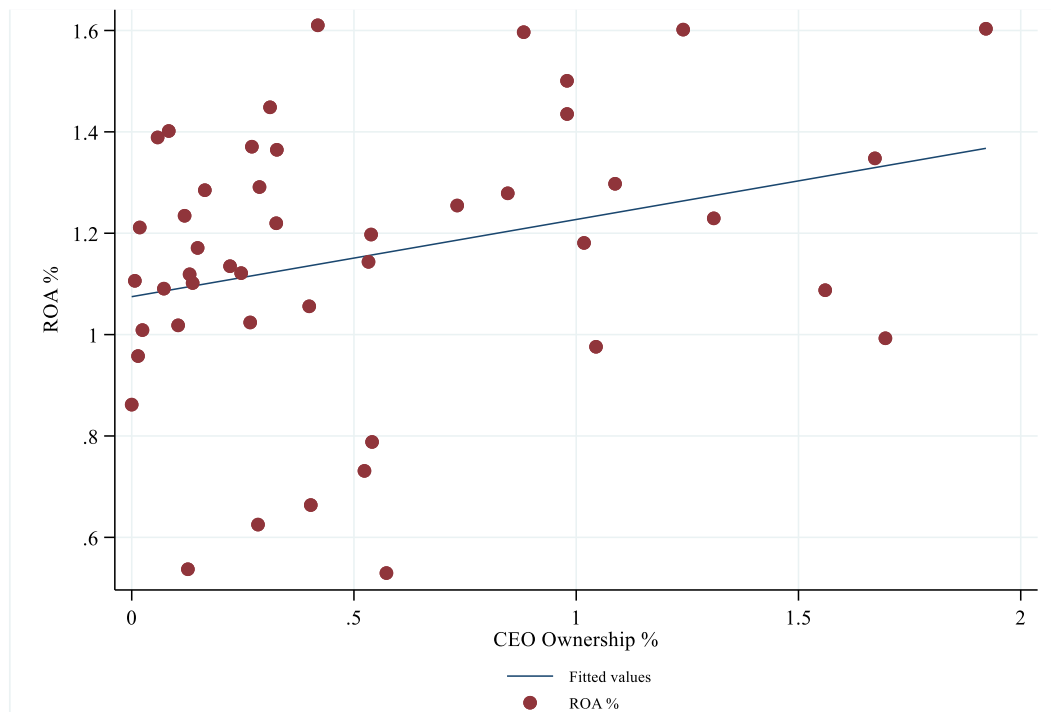
As for the ROA, the results of the linear regression are shown on Table 13 and Figure 6. For the first time, we obtain a positive and significant coefficient using the entire sample, for a level of 5%, for a performance measure, suggesting the existence of a positive relationship between CEO ownership and the bank's ROA. This in line with other studies like Murphy (1999), Jensen and Murphy (1990), Mehran (1992), Yang et al. (2011), Aebi et al. (2012).

Table 13: Linear regression results for ROA and CEO ownership, in 2021

ROA	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	.152	.066	2.29	.027	.019 .286	**
Constant	1.075	.052	20.73	0	.97 1.179	***
Mean dependent var.		1.156	SD dependent var.		0.271	
R-squared		0.084	Number of obs.		46	
F-test		5.265	Prob > F		0.027	
Akaike crit. (AIC)		9.462	Bayesian crit. (BIC)		13.119	

Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$

Figure 6: Linear regression for ROA and CEO ownership, in 2021



If we restrict our sample to ownership above 0.5%, the coefficient is statistically significant only for a level of 10%, for a reduced sample of 19 banks.

Table 14: Linear regression results for ROA and CEO ownership above 0.5%, in 2021

ROA	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	.297	.149	1.99	.063	-.018 .612	*
Constant	.891	.177	5.04	0	.518 1.264	***
Mean dependent var.		1.199	SD dependent var.		0.300	
R-squared		0.186	Number of obs.		19	
F-test		3.968	Prob > F		0.063	
Akaike crit. (AIC)		7.200	Bayesian crit. (BIC)		9.089	

Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$

Interestingly, the results do not hold if we run a quadratic regression: both coefficients are far from statistically significant.

Table 15: Quadratic regression results for ROA and CEO ownership, in 2021

ROA	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	.12	.235	0.51	.613	-.355 .595	
CEO Ownership ²	.02	.143	0.14	.89	-.269 .309	
Constant	1.081	.06	18.17	0	.961 1.201	***
Mean dependent var.		1.156	SD dependent var.		0.271	
R-squared		0.084	Number of obs.		46	
F-test		2.592	Prob > F		0.087	
Akaike crit. (AIC)		11.442	Bayesian crit. (BIC)		16.928	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

The results are relatively improved if we limit the sample to ownership above 0.5%, retrieving only 19 banks. However, the first coefficient is the only one significant and at a level of 10%.

Table 16: Quadratic regression results for ROA and CEO ownership above 0.5%, in 2021

ROA	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	1.538	.875	1.76	.098	-.318 3.393	*
CEO Ownership ²	-.54	.391	-1.38	.186	-1.369 .289	
Constant	.282	.454	0.62	.543	-.68 1.243	
Mean dependent var.		1.199	SD dependent var.		0.300	
R-squared		0.290	Number of obs.		19	
F-test		3.279	Prob > F		0.064	
Akaike crit. (AIC)		6.591	Bayesian crit. (BIC)		9.424	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

7. CEO ownership and bank risk

In this section, I investigate the relationship between CEO ownership and bank risk, using two variables of risk: monthly stock volatility during 2021, and the ratio of Risk Weighted Assets (RWA) to Total Assets.

7.1 Monthly Stock Volatility

One straightforward measure of risk that I considered was the total volatility of stock prices in 2021, calculated from the standard deviation of monthly stock prices that I had previously obtained from CRSP and detailed in section 4– The Sample of Banks.

Table 17: Monthly volatility of stock prices in 2021

#	Bank	Total Assets (\$ mios)	Std Deviation on monthly stock prices in 2021
1	JPMORGAN CHASE & CO	3,743,567	10.4703
2	BANK OF AMERICA CORP	3,169,495	4.7980
3	CITIGROUP INC	2,291,413	5.6923
4	WELLS FARGO & CO NEW	1,948,068	5.9463
5	U S BANCORP DEL	573,284	5.0221
6	P N C FINANCIAL SERVICES GRP INC *	557,191	17.6185
7	KEYCORP NEW	186,346	1.8617
8	SYNCHRONY FINANCIAL	95,748	4.7843
9	COMERICA INC	94,616	8.3927
10	ZIONS BANCORPORATION N A	93,200	5.7307
11	FIRST HORIZON CORP	89,092	1.3112
12	VALLEY NATIONAL BANCORP	43,446	1.0524
13	PACWEST BANCORP DE	40,443	4.8804
14	F N B CORP PA	39,513	0.8909
15	PINNACLE FINANCIAL PARTNERS INC	38,469	8.0549
16	WEBSTER FINANCIAL CORP	34,916	3.1872
17	TEXAS CAPITAL BANCSHARES INC	34,732	5.7833
18	STERLING BANCORP DEL	29,659	2.2975
19	OLD NATIONAL BANCORP	24,454	1.0345
20	HOPE BANCORP INC	17,889	1.1367
21	COMMUNITY BANK SYSTEM INC	15,553	4.3781
22	DIME COMMUNITY BANCSHARES INC	12,066	1.9428
23	SEACOAST BANKING CORP FLA	9,681	2.3413
24	PARK NATIONAL CORP	9,560	8.0651
25	FIRST COMMONWEALTH FINANCIAL CORP	9,545	1.1701
26	BANC OF CALIFORNIA INC	9,394	1.0722
27	CONNECTONE BANCORP INC NEW	8,129	3.8368
28	NICOLET BANKSHARES INC	7,695	5.4936
29	HORIZON BANCORP INC	7,375	1.2841
30	NATIONAL BANK HOLDINGS CORP	7,214	3.1355
31	TRUSTCO BANK CORP NY *	6,197	13.3702
32	FIRST BANCSHARES INC MS	6,077	3.2338
33	CAMDEN NATIONAL CORP	5,500	3.3837
34	MID PENN BANCORP INC	4,689	2.7902
35	SUMMIT FINANCIAL GROUP INC	3,577	1.8806
36	FIRST COMMUNITY BANCSHARES INC	3,195	3.3494
37	SOUTHERN FIRST BANCSHARES INC	2,926	5.9926
38	FIRST BUSINESS FINL SVCS INC	2,653	3.0668
39	FIRST BANCORP INC ME	2,527	2.1706
40	EVANS BANCORP INC	2,211	3.3126
41	AMES NATL CORP	2,137	1.0221
42	L C N B CORP	1,904	1.1249
43	HAWTHORN BANCSHARES INC	1,832	2.0745
44	NATIONAL BANKSHARES INC	1,702	1.7575
45	FIRST COMMUNITY CORP SC	1,585	1.2287
46	AMERISERV FINANCIAL INC	1,336	0.2069
47	PATRIOT NATIONAL BANCORP INC	948	8.2976

* outlier to be excluded

I removed the following outliers: PNC Financial Services (17.62%) and Trustco Bank Corp (13.37%) and ended up with a sample of 45 banks.

The summary statistics are shown in Table 2. Stock volatility values are significantly dispersed, like the stock returns were on section 6, with a minimum of 0.21%, a maximum of 10.47%, an average volatility of 3.55%, and a standard deviation of 2.47 percentage points. The median is 3.16 %. The largest banks showed a higher volatility than the average.

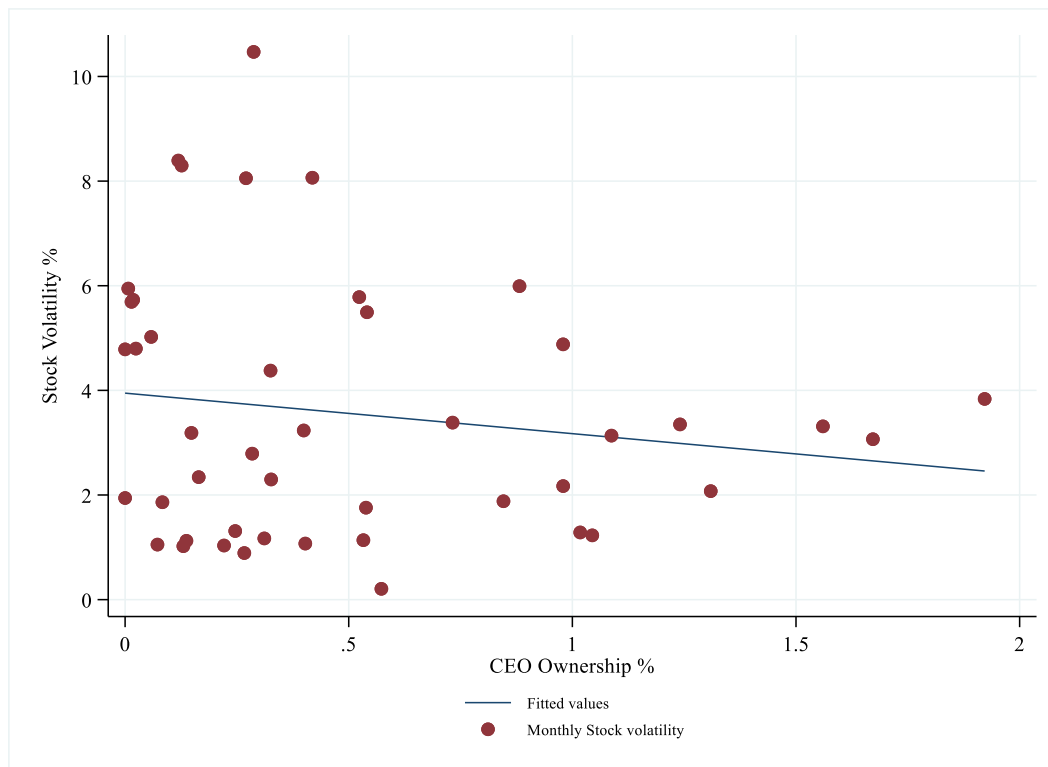
Running a linear regression, we find no evidence of a relationship: the coefficient is negative and statistically non-significant for a level of 10%, as it can be observed on Table 18 and Figure 7.

Table 18: Linear regression results for monthly stock volatility and CEO ownership, in 2021

Stock volatility	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	-.775	.52	-1.49	.144	-1.823	.274
Constant	3.947	.554	7.12	0	2.829	5.065 ***
Mean dependent var.		3.554	SD dependent var.		2.469	
R-squared		0.024	Number of obs.		45	
F-test		2.220	Prob > F		0.144	
Akaike crit. (AIC)		210.963	Bayesian crit. (BIC)		214.576	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

Figure 7: Linear regression for monthly stock volatility and CEO ownership, in 2021



Restricting the CEO ownership to values higher than 0.5% or running a quadratic regression does not render significant results either, as per Table 19 and 20. I therefore do not find evidence that stock volatility has any relationship with CEO ownership.

Table 19: Linear regression for monthly stock volatility and CEO ownership above 0.5%, in 2021

Stock Volatility	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	-.442	.638	-0.69	.493	-1.734	.851
Constant	3.618	.716	5.05	0	2.167	5.069 ***
Mean dependent var.		3.360	SD dependent var.		2.545	
R-squared		0.007	Number of obs.		39	
F-test		0.479	Prob > F		0.493	
Akaike crit. (AIC)		186.251	Bayesian crit. (BIC)		189.578	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

Table 20: Quadratic regression for monthly stock volatility and CEO ownership, in 2021

Stock Volatility	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	-2.669	1.727	-1.55	.13	-6.154	.815
CEO Ownership ²	1.21	.914	1.32	.193	-.634	3.054
Constant	4.311	.636	6.78	0	3.027	5.595 ***
Mean dependent var.		3.554	SD dependent var.		2.469	
R-squared		0.040	Number of obs.		45	
F-test		1.469	Prob > F		0.242	
Akaike crit. (AIC)		212.196	Bayesian crit. (BIC)		217.616	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

7.2 Ratio of RWA to Total Assets

Considering now a second measure of risk, I calculated the ratio of Risk Weighted Assets (RWA) over Total Assets. This ratio indicates the percentage of total assets of the bank that are actually risky assets (like housing loans, business loans, etc, which are more likely to default), as per the weights defined by Basel III Accord. The higher the ratio is, the riskier the bank is.

I obtained data for RWA and Total Assets from Worldscope – Datastream, for 31.12.2021.

Table 21 shows the dataset obtained, sorted by total asset size (largest to smallest), which seems to indicate a tendency of increasing risk for smaller banks, while the 4 major banks have more moderate values of RWA/Total Assets.

Table 21: Ratio of Risk Weighted Assets to Total Assets, in 2021

#	Bank	RWA (\$ Billions)	Total Assets (\$ Billions)	RWA/Total Assets
1	JPMORGAN CHASE & CO	1,547.82	3,743.57	0.4135
2	BANK OF AMERICA CORP	1,399.00	3,160.34	0.4427
3	CITIGROUP INC	1,209.37	2,261.60	0.5347
4	WELLS FARGO & CO NEW	1,239.03	1,948.07	0.6360
5	U S BANCORP DEL	419.78	573.28	0.7322
6	P N C FINANCIAL SERVICES GRP INC	388.53	557.19	0.6973
7	KEYCORP NEW	144.36	186.35	0.7747
8	SYNCHRONY FINANCIAL	84.95	95.75	0.8872
9	COMERICA INC	69.71	94.62	0.7367
10	ZIONS BANCORPORATION N A	59.78	93.10	0.6421
11	FIRST HORIZON CORP	64.17	89.09	0.7202
12	VALLEY NATIONAL BANCORP	34.00	43.37	0.7841
13	PACWEST BANCORP DE	28.52	40.44	0.7052
14	F N B CORP PA	28.99	39.51	0.7337
15	PINNACLE FINANCIAL PARTNERS INC	29.42	38.47	0.7649
16	WEBSTER FINANCIAL CORP	23.94	34.81	0.6877
17	TEXAS CAPITAL BANCSHARES INC	26.67	34.67	0.7693
18	OLD NATIONAL BANCORP	16.59	24.42	0.6795
19	HOPE BANCORP INC	15.04	17.84	0.8431
20	COMMUNITY BANK SYSTEM INC	7.16	15.55	0.4604
21	DIME COMMUNITY BANCSHARES INC	9.74	12.07	0.8070
22	SEACOAST BANKING CORP FLA	6.60	9.65	0.6832
23	PARK NATIONAL CORP	7.49	9.56	0.7835
24	FIRST COMMONWEALTH FINANCIAL CORP	7.32	9.55	0.7671
25	BANC OF CALIFORNIA INC	7.61	9.34	0.8149
26	CONNECTONE BANCORP INC NEW	7.46	8.13	0.9178
27	NICOLET BANCSHARES INC	5.75	7.70	0.7472
28	HORIZON BANCORP INC	4.51	7.37	0.6113
29	NATIONAL BANK HOLDINGS CORP	5.13	7.21	0.7115
30	TRUSTCO BANK CORP NY	3.01	6.20	0.4858
31	FIRST BANCSHARES INC MS	3.56	6.08	0.5862
32	CAMDEN NATIONAL CORP	3.55	5.48	0.6483
33	MID PENN BANCORP INC	3.10	4.68	0.6625
34	SUMMIT FINANCIAL GROUP INC	3.04	3.58	0.8510
35	FIRST COMMUNITY BANCSHARES INC	2.04	3.19	0.6397
36	SOUTHERN FIRST BANCSHARES INC	2.31	2.92	0.7903
37	STERLING BANCORP DEL	1.43	2.86	0.5007
38	FIRST BUSINESS FINL SVCS INC	2.60	2.65	0.9838
39	FIRST BANCORP INC ME	1.63	2.53	0.6434
40	EVANS BANCORP INC	1.47	2.21	0.6628
41	AMES NATL CORP	1.41	2.14	0.6598
42	L C N B CORP	1.43	1.90	0.7527
43	HAWTHORN BANCSHARES INC	1.42	1.83	0.7779
44	NATIONAL BANKSHARES INC	0.99	1.70	0.5814
45	FIRST COMMUNITY CORP SC	0.95	1.58	0.6029
46	AMERISERV FINANCIAL INC	1.06	1.34	0.7956
47	PATRIOT NATIONAL BANCORP INC	0.95	0.94	1.0173

As per Table 2, we can observe a minimum value of 41.35% and a maximum of 101.73%, which shows a considerable dispersion, with a standard deviation of 13.03 percentage points and an average of 70.49%. The median is 71.15%. The four major banks are among the ones with the lowest ratios of RWA to Total Assets, below the average, and actually two of them have the lowest values: JP Morgan Chase with 41.35% and Bank of America with 44.27%, which indicates a strong focus on risk management by these large banks.

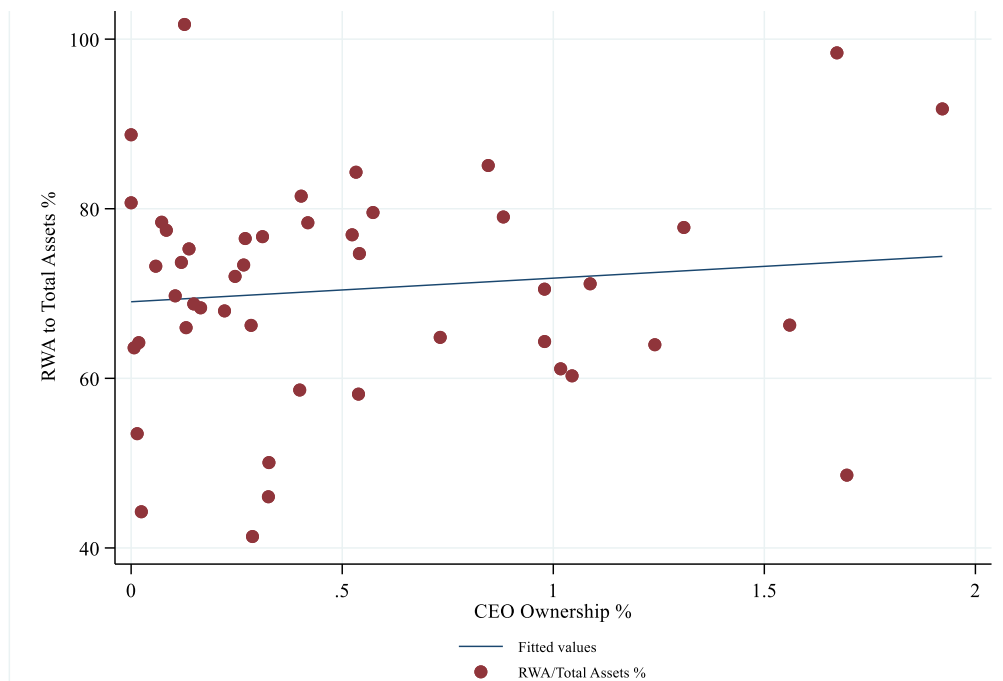
Running a linear regression on the ratio of RWA to Total Assets, I do not obtain any evidence of a relationship with the CEO ownership: the coefficient is positive but far from significant, as shown in Table 22. This can be easily observed in figure 8, where the linear prediction line is quite far from most dots.

Table 22: Linear regression for the ratio of RWA to Total Assets and CEO ownership, in 2021

RWA to Total Assets	Coef.	St. Error	t-value	p-value	95% Conf. Interval	Sig.
CEO Ownership	2.784	4.699	0.59	.556	-6.68 12.248	
Constant	69.031	2.95	23.40	0	63.09 74.972	***
Mean dependent var.		70.491	SD dependent var.		13.033	
R-squared		0.012	Number of obs.		47	
F-test		0.351	Prob > F		0.556	
Akaike crit. (AIC)		377.137	Bayesian crit. (BIC)		380.837	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

Figure 8: Linear regression for the ratio of RWA to Total Assets and CEO ownership, in 2021



The results are not improved when running a quadratic linear regression, where both coefficients are still not statistically significant.

Table 23: Quadratic linear regression results for RWA/Total Assets and CEO ownership, in 2021

RWA to Total Assets	Coef.	St. Error	t-value	p-value	[95% Conf. Interval]	Sig.
CEO Ownership	-7.517	11.788	-0.64	.527	-31.274 16.24	
CEO Ownership ²	6.395	7.918	0.81	.424	-9.561 22.352	
Constant	71.011	3.637	19.53	0	63.682 78.34	***
Mean dependent var.		70.491	SD dependent var.		13.033	
R-squared		0.029	Number of obs.		47	
F-test		0.380	Prob > F		0.686	
Akaike crit. (AIC)		378.312	Bayesian crit. (BIC)		383.863	

*Statistical significance for levels of *** $p < .01$, ** $p < .05$, * $p < .1$*

8. Conclusion

My research on the relationship between CEO ownership and banks' performance has found limited and mixed evidence of a positive interaction. As for the banks' risk, I found no evidence of a relationship with ownership.

For the three performance measures that I considered, I found limited evidence of a linear relationship with stock returns, if we consider the entire sample of banks, but no evidence for ROE. Only if we restrict the sample to an ownership above 0.5%, we can obtain significant results of a positive coefficient for ROE, for a limited number of banks.

After running a quadratic regression on the entire sample, the results are more solid for stock returns and seem to indicate a positive exponential relationship with CEO ownership for a significance level of 5%. This suggests the possibility of having a minimum threshold of ownership above which there could be an exponential increase in the bank's stock performance. However, this argument is not supported if we use the ROE or ROA as variable.

The ROA was the only performance measure for which we obtained more solid evidence of a linear positive relationship with CEO ownership, with a positive coefficient which is statistically significant at the level of 5% using the entire sample. However, we didn't find any evidence of an exponential relationship with ownership.

Regarding the two risk variables that I analysed, none of them retrieved significant results. The monthly stock volatility of 2021 showed no relation with the CEO ownership, either linear or quadratic, and the same is true for the ratio of RWA to Total Assets. I therefore cannot conclude that CEO ownership has a relationship with the risk level of a bank. There are certainly other factors influencing the latter which are not captured in the present study.

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10. Appendix I

Table 1: CEO ownership of listed US Banks in 2021, in % of shares owned

#	Bank	Total Assets (USD Mios)	Total Shares Outstanding	CEO in 2021	% Shares owned by the CEO	Total shares owned by the CEO	#Shares directly owned	#Shares indirectly owned
1	JPMORGAN CHASE & CO	3,743,567	2,955,266,000	Jamie Dimon	0.29%	8,495,281	536,783	7,958,498
2	BANK OF AMERICA CORP	3,169,495	8,184,084,000	Brian Moynihan	0.02%	1,977,236	1,874,019	103,217
3	CITIGROUP INC	2,291,413	1,984,267,000	Jane Fraser	0.01%	284,086	284,086	-
4	WELLS FARGO & CO NEW	1,948,068	3,987,233,000	Charles W. Scharf	0.01%	284,214	284,214	-
5	U S BANCORP DEL	573,284	1,482,798,000	Andrew Cecere	0.06%	865,623	852,923	12,700
6	P N C FINANCIAL SERVICES GRP INC	557,191	422,641,000	William S. Demchak	0.10%	441,397	439,058	2,339
7	KEYCORP NEW	186,346	931,058,000	Christopher M. Gorman	0.08%	776,501	772,345	4,156
8	SYNCHRONY FINANCIAL	95,748	547,259,000	Brian D. Doubles	0.00%	-	-	-
9	COMERICA INC	94,616	131,149,000	Curtis C. Farmer	0.12%	156,060	156,060	-
10	ZIONS BANCORPORATION N A	93,200	151,625,000	A. Scott Anderson	0.02%	27,407	27,407	-
11	FIRST HORIZON CORP	89,092	540,750,000	D Bryan Jordan	0.25%	1,331,574	1,174,298	157,276
12	VALLEY NATIONAL BANCORP	43,446	421,437,000	Ira Robbins	0.07%	304,979	301,836	3,143
13	PACWEST BANCORP DE	40,443	119,585,000	Matthew P. Wagner	0.98%	1,171,090	1,101,162	69,928
14	F N B CORP PA	39,513	318,928,000	Vincent J. Delie	0.27%	850,252	789,670	60,582
15	PINNACLE FINANCIAL PARTNERS INC	38,469	76,100,000	M. Terry Turner	0.27%	205,718	152,417	53,301
16	WEBSTER FINANCIAL CORP	34,916	90,589,000	John R. Ciulla	0.15%	134,327	119,736	14,591
17	TEXAS CAPITAL BANCSHARES INC	34,732	50,618,000	Rob C. Holmes	0.52%	265,029	265,029	-
18	STERLING BANCORP DEL	29,659	192,701,000	Jack L. Kopnisky	0.33%	629,145	614,684	14,461
19	OLD NATIONAL BANCORP	24,454	165,838,000	James C. Ryan III	0.22%	366,881	365,357	1,524
20	HOPE BANCORP INC	17,889	120,006,000	Kevin S. Kim	0.53%	639,318	639,318	-
21	COMMUNITY BANK SYSTEM INC	15,553	53,931,000	Mark E. Tryniski	0.33%	175,366	57,569	117,797
22	DIME COMMUNITY BANCSHRS INC	12,066	39,878,000	Kevin O'Connor	0.00%	-	-	-
23	SEACOAST BANKING CORP	9,681	58,504,000	Charles (Chuck) Shaffer	0.16%	96,278	96,278	-
24	PARK NATIONAL CORP	9,560	16,220,000	David L. Trautman	0.42%	67,912	29,932	37,981
25	FIRST COMMONWEALTH FINANCIAL	9,545	94,932,000	Thomas Michael Price	0.31%	295,463	295,463	-
26	BANC OF CALIFORNIA INC	9,394	62,180,000	Jared M Wolff	0.40%	250,519	205,419	45,100
27	CONNECTONE BANCORP INC NEW	8,129	39,568,000	Frank Sorrentino III	1.92%	760,392	759,976	416
28	NICOLET BANCSHARES INC	7,695	13,994,000	Michael E. Daniels	0.54%	75,674	75,674	-
29	HORIZON BANCORP INC	7,375	43,548,000	Craig M. Dwight	1.02%	443,135	243,579	199,556
30	NATIONAL BANK HOLDINGS CORP	7,214	30,298,000	G Timothy Laney	1.09%	329,470	323,383	6,087
31	TRUSTCO BANK CORP NY	6,197	19,220,000	Robert J. McCormick	1.70%	325,881	237,050	88,831
32	FIRST BANCSHARES INC MS	6,077	21,019,000	Milton Ray Cole Jr.	0.40%	83,941	83,941	-
33	CAMDEN NATIONAL CORP	5,500	14,740,000	Gregory A. Dufour	0.73%	107,931	107,931	-
34	MID PENN BANCORP INC	4,689	15,958,000	Rory G. Ritrievi	0.28%	45,349	41,450	3,899
35	SUMMIT FINANCIAL GROUP INC	3,577	12,743,000	H. Charles Maddy	0.85%	107,804	41,250	66,554
36	FIRST COMMUNITY BANCSHARES INC	3,195	16,878,000	William P. Stafford, II	1.24%	209,397	205,231	4,166
37	SOUTHERN FIRST BANCSHARES INC	2,926	7,926,000	R. Arthur "Art" Seaver, J	0.88%	69,891	69,891	-
38	FIRST BUSINESS FINL SVCS INC	2,653	8,458,000	Corey Chambas	1.67%	141,416	124,424	16,992
39	FIRST BANCORP INC ME	2,527	10,999,000	Tony C. McKim	0.98%	107,732	99,466	8,266
40	EVANS BANCORP INC	2,211	5,467,000	David J. Nasca	1.56%	85,293	84,741	552
41	AMES NATL CORP	2,137	9,092,000	John Patrick Nelson	0.13%	11,843	11,843	-
42	LC N B CORP	1,904	12,415,000	Eric J. Meilstrup	0.14%	17,017	17,017	-
43	HAWTHORN BANCSHARES INC	1,832	6,617,000	David T. Turner	1.31%	86,644	38,234	48,410
44	NATIONAL BANCSHARES INC	1,702	6,064,000	F. Brad Denardo	0.54%	32,660	16,993	15,667
45	FIRST COMMUNITY CORP SC	1,585	7,549,000	Michael C Crapps	1.04%	78,853	69,048	9,805
46	AMERISERV FINANCIAL INC	1,336	17,082,000	Jeffrey A. Stopko	0.57%	97,881	97,881	-
47	UNITED BANCSHARES INC *	1,077	3,273,000	Richard M. Adams Sr.	26.35%	862,362	782,686	79,677
48	PATRIOT NATIONAL BANCORP INC	948	3,956,000	Robert G. Russell, Jr.	0.13%	5,000	2,500	2,500

Note: This dataset was built manually with data on CEO ownership disclosed publicly on Form 3 and 4 of Section 16 on the Security and Exchange Commission's (SEC) website, namely the

Electronic Data Gathering, Analysis, and Retrieval system (EDGAR). All values of Total Assets and Total Shares Outstanding are at end of 2021, obtained from Worldscope –Datastream and Compustat (WRDS) respectively, for all listed US banks with SIC Code 6021, excluding the banks merged with other banks or delisted in 2021.

*The outlier United Bancshares Inc. presents an abnormal CEO ownership of 26.35% and is therefore excluded from the sample, for regression purposes.