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1 Introduction

Even though the great financial crisis ended some years ago, the issue of executive compensation and incentives is still present and will be as long as its design remains the same and the participants remain humans who are not always behaving rationally. In my thesis, I analyse the change in a typical bank's incentive contract in the post-2008 crisis era, i.e., whether the compensation has become more aligned with the bank's long-termism. My region of focus will be the United States since it hosts a significant percentage of global G-SIBs (global systemically important banks). Amid the tremendous financial downturn of 2008, the mentioned banks possessed very similar business models causing high levels of systematic risk for the global economy. The collapse of some central banks, such as Bear Stearns and Lehman Brothers, outlined flaws in the stability of the financial institutions causing an urgent need for re-examination and tightened regulation of the financial institutions. One of the flaws outlined by the academics was the structure of executive compensation which was tied to many adverse outcomes of the crisis.

The equity-based executive compensation was designed to generate long-term incentives for executives by tying their pay to the bank's share price. With such a mechanism, the principal-agent problem is mitigated and the executive's goals align with the shareholders' since the compensation is tied to how well the bank is performing in the market. However, following the bank deregulation in the mid-1990s, US banks and companies have started using option and stock awards with performance-based ties to a much greater extent. These instruments, especially the options, have been linked to excessive risk-taking among the top executives who, most likely, acted in their self-interest to maximise the gains from these compensation structures.

As Bebchuk et al. (2009) stated, top executive officers at Lehman Brothers and Bear Stearns pocketed somewhere from 1 to 1.4 billion USD together before the institutions collapsed in the wake of the crisis. It is important to note that Bear Stearns was ten times smaller than Leman Brothers. It indicates some mismatch in the compensation structure. Authors emphasised that such a mismatch of rewards encouraged the executives to behave in a way that aligned with the short-term. They drew attention to the occurrence of taking out vast numbers of stock and options by CEOs during this time, allowing them to develop an incentive-driven behaviour that significantly affected their strategies influencing stock worth. With this structure, CEOs have a positive personal benefit from these short-term effects,

which can, and most likely did, cause them not to prioritise the best interest of the long-term stability of the bank.

In my five models, I first test whether the largest US banks endured greater financial losses in the crisis than smaller banks. Then I test whether the banks that endured greater losses adjusted their compensation structure post-crisis as I predicted. Lastly, I examine whether the compensation structures I have chosen indeed align with long-termism. Essentially, I want to know if more enormous bank losses encouraged the increase in one type and decrease in another type of compensation. I hypothesised that the banks that incurred more losses during the crisis have learned from their mistakes and have altered their compensation structure to better align with the long-term plans due to either pressure from shareholders, regulation, or public perception (all of the listed factors are outside of the scope of my thesis).

My overall findings can be summarised in the following way. I find evidence that the larger the bank, the greater the adjusted magnitude of the losses. Additionally, I find that options as a part of total executive compensation have decreased post-crisis for the banks that suffered greater losses. In comparison, the percentage of the restricted shares as part of total executive compensation increased statistically significantly for the banks that suffered greater losses in the crisis. I used a fixed effects model with robust standard errors and conducted five models and three tests to see which type of regression best aligns with my data.

2 Literature

2.1 Agency Theory – Principal Agent Problem

Agency theory can occur in organisations where the ownership is separated from the control and the appointed agent acts on the behalf of the principal. If met with specific incentives, an agent can take actions that do not align with the principal's best interest but rather the agent's. The previous sentence is an example of the moral hazard issue. Moral hazard is relevant for my topic because a bank's CEO acts as an agent to the bank shareholders and he/she can have specific incentives to take excessive risks or other similar actions to gain higher returns through his/her compensation package.

Chen et al. (2006) explain this mechanism through the example of a CEO with option-based compensation. They emphasise that the option-based executive compensation increases as the stock tied to those options grows, which pursues CEOs to engage in strategies that elevate the stock in a risky, short-run fashion. This example is the textbook example of what

they call the classic moral hazard problem, which exacerbated the losses in the savings and loan industry and the financial crisis of 2008.

Another type of moral hazard issue mentioned in the related literature is at the core of the financial industry – deposit insurance and government bailout policies. According to Becht et al. (2011), banks are multi-constituency organisations as the bondholders and depositors, contributing the largest share of the bank's capital, have little to no say in the most critical decisions made by banks. The most influential decision-makers in the banks do not need to request depositors' input on significant issues. Nevertheless, while depositors can withdraw their funds if they disapprove of the strategies, they usually choose not to due to the protection facilitated by the deposit insurance. As Hagendorff and Vallasca (2011) point out, deposit insurance, bailout policies, and deposit insurance give no incentives to the bank creditors to limit the CEO's actions. They suggest a way to mitigate this moral hazard issue - monitoring by uninsured claim holders.

Many researchers, such as Zhu (2017), examined the dynamic principal-agent problem. He concluded that the usual view of moral hazard, such as the one in insurance, instructs us to reward good outcomes and punish bad ones. However, he believes that rewarding today encourages the manager to take short-term action. According to his model, a better strategy is to reward the manager when the long-term effects of today's actions are shown. Therefore, next, I will discuss ways compensation can enable the delayed reward system.

2.2 Executive Compensation

Studying executive compensation is not a recent phenomenon. It started in the 1980s, expanding from the classic principal-agent model. The main contributing factor to the increase in the interest in executive compensation was the increase in the data availability for different financial and non-financial institutions. Moreover, thus we experienced the start of the production of academic work focusing on the effects of different types of executive compensation.

Fast forward a few decades, the compensation of the top executives, especially a typical CEO, has been linked to several issues that have appeared in the modern economy. In the past 20 years, the option and stock-based CEO compensation have significantly increased. According to Becht et al. (2011), the median exposure of CEO wealth to firm stock prices increased three times between 1980 and 1994 and two times between 1994 and 2000. Although the equity-based CEO compensation has initially aligned the CEO's incentives to

the shareholders', the increased use of options has been linked to short-termism and excessive risk-taking.

Researchers such as Walker (2009) pointed out that insufficiently well-structured compensation arrangements are to blame for the 2008 financial crisis. He adds that compensation is not appropriately tied to long-term stability and growth and leads to reckless short-term decision-making and even financial bubbles, whose effects extend beyond an organisation to the economy as a whole.

The main components of CEO compensation usually consist of salary, shares of that bank, options on those shares and bonuses. In a standard options package, a set number of option units vest each year-end typical in order to contribute to the amount of compensation that a CEO cashes out at the end of the year. This vesting period encourages the CEO to remain employed at the bank, and once the options vest, they remain exercisable for years. The standard rules thus far allow the CEOs to use the said option package and resell the underlying shares as soon as they vest. This ability often leads the executive to focus more on the short-term prices since they will be affecting the value of the assets underlying the options upon selling. On the other hand, the restricted shares are not owned right away when granted; instead, the CEO has to wait for sometimes up to 4 years to own and sell them. (Bebchuk et al., 2009)

The views are divided on the risk-taking effect. While Bhagat and Bolton (2014), Chen et al. (2006), Hagendorff and Vallascas (2011) and Gande and Kalpathy (2017) find evidence that stock and option-based compensation leads to an increase in bank risk-taking, authors such as Fahlenbrach and Stulz (2011) disagree with these findings and find evidence that banks who's CEO compensation benefits were more in line with the shareholders' benefits displayed worse performance in the 2008 recession. Mehran and Rosenberg (2007) discovered that options led CEOs to partake in more risky investments, allegedly causing vast volatility in equity and assets.

From these works, I have drawn inspiration for testing different components of the executive package (such as options and stocks). However, I do not focus on a CEO's risk-taking actions but rather on his/her horizon in terms of short-termism vs. long-termism. I do not tackle the risk-taking effect because, according to the works I found in the most widely-acclaimed journals, the results are pretty contradicting. Some find evidence that equity-based compensation led to risk-taking during the financial crisis, while others claim such statements are not based on credible evidence and that other factors could explain the possible statistical relevance.

As suggested by academics including Bhagat and Bolton (2014) and Bebchuk et al. (2009), the solution to aligning the executive incentives with stable long-term growth exists in the form of restricted shares, which executives cannot cash out at their convenience but instead 2-4 years upon their departure from their job position. In theory, this would ensure that executives have a vested interest in the long-run stability of the bank stock price as they cannot dispose of its shares for years after their departure. In addition to this, Gong et al. (2008), Cheng and Warfield (2005), Cornett et al. (2008), Bergstresser and Philippon (2006) link the use of options in executive pay packages to short-termism among executives. Therefore, in this thesis, I look at the variable compensation components tied to the stock price – restricted equity and options.

I would emphasise that I isolate the CEOs as they have the most influence and have the last say in the most significant projects a bank undertakes. Although other lower-level executives also have equity-based compensation, the units they are responsible for often do not substantially influence the bank's stock price. According to Becht et al. (2011), bonus compensation is the most effective in tying the incentives of the lower-ranked executives to the long-term results and not the equity-based one. Therefore, I will only focus on the CEOs and their equity compensation packages.

2.3 The United States, Financial Crisis and Regulation

The reason for choosing the US as a country of focus is because it has a large percentage of banks crucial to the world economy as a whole (global systemically important banks – G-SIBs). According to the latest BIS listing, 20% of the G-SIB banks are based in the US. This percentage was even higher in the first listing of G-SIBS in 2011 – 28%. More importantly, these banks have nearly 12 trillion USD combined total assets. (Global, 2017)

Additionally, throughout my sample period, the US has implemented the Generally Accepted Accounting Principles (GAAP) accounting standard enforced by the financial accounting standards board (FASB) – the financial accounting standard board and the SEC. These have been active on the federal level since the 1930s and apply to all publicly listed companies and, more broadly, all companies that publish their financial statements publicly. This implies that all banks in my sample had standardised reporting of their financial statements in the focus period. This allowed me to extract the appropriate financial parameters and KPIs from the bank's balance sheets more easily. This occurrence was essential for being able to develop control variables to support my models.

Some other reasons that make the US a good area of focus are that American banks were, according to numerous academics, the initiators and exacerbators of the Great Financial Crisis and that the most significant regulatory measures were applied on the federal level (covered all of the states) making their effect more or less regionally uniform. In addition, the fact that regulation affecting executive compensation and other variables in my sample was introduced nationwide made it possible to exclude other potential effects, which would be a difficult task to do if the region was, for example, Europe. Lastly, most of the large US banks were traded on the market exchanges such as NYSE or NASDAQ, resulting in a more convenient way to develop comparable market capitalization values, stock price volatility and bank losses. Therefore, I analysed the relevant data using the S&P Capital IQ, which hosts data for all significant US banks relevant for my sample in the appropriate period.

As for some of the reasons why I chose this specific period of focus to investigate equity-based compensation, as I have mentioned already, the CEO compensation structure has been connected to the horrendous consequences of the 2008 Financial Crisis. Some of the researchers examining this relationship included Bhagat and Bolton (2014), Gande and Kalpathy (2017), Hagendorff and Valsalas (2011), who hypothesised and found evidence that performance-based and equity-based pay among executives act as a significant factor in the 2008 crisis. Bebchuk et al. (2009) point out that the top management at Bear Stearns and Lehman Brothers collected approximately \$1.4 billion and \$1 billion during the crisis. Fahlenbrach and Stulz (2011), on the other hand, argue that the CEOs across numerous banks globally endured significant losses due to their equity exposure. They explain that by being able to anticipate and influence the crash that occurred ex-ante, they would have probably traded their equity positions for cash earlier to ensure greater profits.

Nevertheless, Thanassoulis (2012) argues that many banks that received government assistance made dividend payments to the executives even during the worst downfalls. He emphasises that these payments were large enough to have an immense impact on the capital structure and triggered further lending by these banks. This would slightly undermine the previous point, as executives could have anticipated that they would be protected in one way or another and still receive large compensation packages regardless of the state of their respective institutions.

I find it crucial to emphasise that executive compensation is only partly to blame for the extent of the downfalls that occurred in the crisis. The factors that have influenced the crisis are complex and it is difficult to determine to what extent each contributed, especially since the factors are connected. Bhagat and Bolton (2014) summarised these factors very well. They

point out the misguided government policies, such as low-interest rates and emphasis on subprime risk-taking by government-supported organisations, which led to the mortgage crisis. Additionally, they include the factor of the Basel Accord as a source of inadequate market discipline due to its favourable treatment of securitized subprime loans over conventional assets. They emphasised the internal factors such as strategies depending on significant levels of leverage and short-term financing of long-term assets, ineffective design of compensation structures and dependence on valuation and risk models with assumptions that are not entirely realistic.

It is essential to mention that right before the crisis; there was an incline in the complexity of the financial instruments, such as collateralised debt obligations. The instruments became quite layered and it became very complex to pinpoint which assets were pooled behind these securities. As demand for these instruments grew, the quality and legitimacy of their underlying assets decreased while the risk increased. The use of the mentioned instruments was vast at the time and since most systemically significant banks were exposed to them and among themselves had similar business models, the extent of the collapse was magnified. The US authorities had several different responses to the crisis. According to Fahlenbrach and Stulz (2011), an explanation for the stock market's collapse during the credit crisis is that bank executives had poor incentives and their compensation was not aligned with long-term bank performance. One of those is the most prominent federal law concerning executive compensation and for that reason, it is essential to address its impact on the banks in my sample. With this one, the Obama administration developing mechanisms to alter the compensation practices and make them more closely related to long-term performance. In time, these mechanisms developed into the 848-page federal law enacted on July 21st, 2010, by the 111th United States Congress. I refer to the Dodd-Frank Act.

This Act had several important missions, which Acharya et al. (2011) summarised in their analysis of the Act's effectiveness. One mission was to identify systemic risk by setting up Systemic Risk Council that regulates and identifies the nonbank financial institutions as systemically important. The Act establishes the U.S. Treasury office to analyse information to anticipate future crises. Another was proposing an end to the too-big-to-fail term. It suggests that liquidating among the systemically significant banks ruling out the taxpayer funding requires the dismissal of management and costs to be borne by the shareholders and creditors. Additionally, the Act aims to regulate the derivatives market, especially the more complex instruments traded over the counter and addresses the lending practices, disclosures in hedge funds and conflict resolution at rating agencies.

While the above are the essential purposes of the Dodd-Frank Act, the ones most relevant to my research questions concern the corporate governance and compensation sections. These focus on allowing the boards to be more independent while increasing transparency and mandatory disclosures. They mandate the Securities and Exchange Commission (SEC) to enforce the existence of independent compensation committees and consultants for all public institutions. Another significant contribution is providing the ‘say on pay’, allowing the investors themselves to vote on executive compensation. Section 956 mandates appropriate Federal regulators to prohibit any incentive-based pay that encourages risks and causes losses to the relevant institution. Section 953 requires each issuer to disclose precise details of any compensation, including the relation between the issuer's performance and executive compensation paid, controlling for any increase or decrease in the stock value and other accompanying profits (dividends). (Dodd-Frank Act, section 953, 2010).

There are two reasons why I included the information on this Act. One is that the wording of the sections above clearly displays that, from the standpoint of the regulators, the executive compensation structure prior to the credit crisis had a significant negative impact on financial stability. There was a need for a reform and the fact that this law was passed by congress on a federal level displays the issue's importance. The other reason is that, while I acknowledge the numerous academics studying the impact and effectiveness of this law, I did not conduct a thorough analysis on my own. My aim was simply to investigate whether all banks in my sample are equally affected by Dodd-Frank Act. If not, my cross-institution comparison would contain bias if not controlled for the effects of regulation. I have discovered that the sections concerning executive compensation apply to all public institutions in the United States. Since all the banks in my sample were public institutions, I could conclude that Dodd-Frank Act would not bias my conclusions.

2.4. Short-termism

Short-termism is any action by top executives that prioritises short-term gains over the long-term. According to the more theoretical approaches, CEOs and other top management could potentially partake in myopic behaviour (short-term) in case they can benefit from it in the short term. Additionally, executives tend to quickly unwind their holdings, displaying myopia. CEOs have the opportunity and ability to prolong their investments so they can earn more from the higher stock prices. Essentially, this leads to a decrease in the investment horizons. Evidence shows that CEO's option exercises and share selling increased significantly following the period of investment cuts. (Ladika & Sautner 2019)

Zhu (2017) talks about the moral hazard problem among executives by defining *the myopic agency* as the manager taking actions that might look good at the moment but hinder long-term profits. He draws attention to the inherent myopic agency in the financial markets by explaining how subprime lending relates to this issue. He describes subprime lending as a legitimate long-term strategy; however, performing such action thoroughly and legitimately requires careful vetting of the borrowers and diligence in estimating associated risks. Without the right incentives, a manager might engage in non-selective rushed lending that would benefit the borrower to an unproportionate extent. The author recognises that having such a short-term strategy could improve business at one particular moment in the near period; however, it could have significant negative impacts in the long term.

According to several researchers, Bergstresser and Philippon (2006), Cheng and Warfield (2005) and Bird et al. (2021) and Walker (2009), unrestricted equity and options may be associated with the short-termism of the top executives. Gopalan et al. (2014) go further and use a pay duration variable, a weighted average of the vesting periods of several short-term and long-term compensation tranches. They find that short-duration compensation contracts influence executives to take more actions to manipulate the short-term bank performance.

One of the indicators of short-termism often analysed in the literature is earnings management. (Gong et al., 2008, Cornett et al., 2008, (Xuefeng) et. al., 2010) This indicator represents manipulating accounting data by distorting cash flow timing and manipulating accruals. This happens in a certain period to increase the stock price in the short term – usually before the options' vesting period or towards the end of the CEO tenure. (Marinovic & Varas, 2019)

Short-termism, in general, is problematic since there is evidence of spill-overs in the rest of the economy. Specifically, Bird et al. (2021) investigate this phenomenon through the effects of covenant enforcement decisions. They find a strong relationship between the short-termism of the lenders and covenant breaches, especially in the case of top executives having their pay closely tied to the bank's performance. The lender, in this case, is faced with a trade-off as enforcing a covenant breach increases its short-term gains but harms the relationship with the borrower, reducing long-term earnings. Earnings management is a valuable tool; however, since my thesis is centered around banks and not industry firms, as mentioned in most of the cited research, I choose to forgo this option.

Some authors use the loan loss provisions to capture the earnings management among bank executives. Ahmed et al. (1999) seize the earnings management via the discretionary component of the loan loss provisions in the form of residuals of an OLS regression of LLP.

Authors Ladika and Sautner (2019) use the random timing of the implementation of FAS 123R to isolate the effect of early option exercise on the investment horizon. They showed significant evidence that the executives spend less on long-term investment when they have more short-term incentives.

I draw inspiration from these papers; however, I take a different direction in capturing the long-termism indicators. I take a more comprehensive approach by creating proxies that are developed using different components on the bank's balance sheet. When properly analyzed, the balance sheet can provide a vast amount of insight into the bank's situation. The most relevant insight for my thesis is the composition of the assets in terms of what percentage of those were long-term and what short-term. I developed the long-term asset variable (a ratio) by first identifying the short-term assets, subtracting them from the total assets, and dividing that number by total assets. The purpose of this was to save time in data collection as the balance sheets I have used as sources had more long-term subcategories.

The (GAAP)accounting standards require all banks to disclose their balance sheets in the annual reports to allow the use of different components in creating variables for cross-institutional comparison. For developing the variables for my regression, I needed to identify the different subcategories of assets and determine which ones are of short-term and which of long-term nature.

On the asset side, I found the different categories within the balance sheets: cash, net loans, long-term investments, goodwill, intangibles, property/plant/equipment, other long-term assets and other assets. Out of those categories and their subcategories, I have identified the components with shorter maturities (up to around one year) under the category other earning assets. The first subcategory I included in my variable contains the federal funds sold and security purchased under resale agreements. These assets have short maturities, especially the federal funds sold, which are, similarly to most other federal funds transactions, traded overnight. Apart from them, another subcategory I included is the trading account assets that are held to resell and benefit from the short-term price changes. Then there are other short-term investments, which need no elaboration as they are disclosed as short-term. Lastly, I included the total investment securities comprised of securities held and securities for sale, which have maturities up to one year.

2.5 Empirical Evidence

I have gathered inspiration from the following works to develop my model. Livne et al. (2013) investigate the effects of CEOs' cash bonuses on performance, investments horizon and

riskiness. They conclude that banks with short-term investment intensity award higher bonuses and display greater risk and inferior performance to those with long-term investment focus. They capture a bank's investment horizon by analysing the balance sheets and the composition of the assets. They distinguish the short-term assets by exploiting the regulatory accounting rules that necessitate banks to deliver balance sheet info about asset types with differentiating short-term vs. the long-term investment. They found a positive and stat-significant relationship between cash bonuses as a percent of compensation and current short-term investment intensity. Additionally, their model shows that short-term investment intensity has a positive stat-significant relationship with the volatility of the stock prices while having a negative relationship with performance (current), most significantly during the great financial crisis.

Another paper by Gopalan et al. (2014) influenced my work. They used the duration of executive pay to seize the mix of short-term and long-term CEO pay. They use the vesting schedules to determine which part of the executive compensation package is short-term vs. long-term. Their study exhibits that executive contracts with short duration are significantly positively related to the incentive (managerial) to influence short-term performances. They find a significant relationship between the duration variable and firm characteristics and industry. Duration is longer in large institutions, firms with more occasions for growth, a larger proportion of long-term assets, higher research and development intensity, better prior share price performance and lowers risks. In addition, Gopalan's team found that CEOs with longer duration contracts, on average, gain higher compensation but lower bonuses.

Laux (2012) finds an indication that the premature stock options vesting period affects the myopic behaviour of the CEOs through the channel of CEO re-hiring, which does not translate to an issue. He emphasises how the conventional view of criticism towards the short-term performance focus is limiting as it overlooks the substantial effect this focus has on early feedback about the CEO, which leads to essential decisions in re-hiring if needed. They believe that the optimal design of stock option vesting conditions is less evident than the traditional view suggests, as long vesting periods can induce excessive short-term investments, which is the opposite of the aim of the long vesting periods.

Bergstresser and Philippon (2006) show that more "incentivized" CEOs, in other words, the CEOs whose compensation is more share price-sensitive, lead firms that exhibit higher levels of earnings management. Their data shows that these CEOs use the discretionary components of earnings more aggressively in affecting their firm's performance. The authors emphasise that periods of high accruals overlap with inconsistently high levels of option exercises by the CEO. They suggest that the best outcome is having incentives based on stock

price performance, paired with carefully considering the opportunities managers have for exploiting these incentives.

Ladika and Sautner's (2019) study finds evidence that managerial myopia is, to a great extent, connected to the vesting period of stock options. They use a unique circumstance of implementing FAS 123 standards, requiring firms to report the cost of option compensation on their income statements. This permitted executives to exercise the options sooner and benefit from the improved short-term performances. Their findings show that more than 700 firms eliminated the options vesting periods, resulting in about a 60% reduction in median CEO incentive horizon length to preserve accounting earnings. They could pinpoint the effect of this regulation over some other underlying cause because the standards were not implemented among all firms at the same time. In addition, they find that firms did not recover to the longer investment horizons after option acceleration and that the executives likely benefited from the myopic investment cuts.

3 Methodology:

3.1 Sample and Variables

I developed five linear OLS models, which I later transformed into fixed effects regression models executed in the STATA program. They are grouped into three categories. The first category is linking the bank size with losses. The second is connecting proxy for losses to the different compensation components, and the third category is testing whether these compensation components are linked with long-termism in this particular time frame. Since my study produces a longitudinal – cross-sectional (across banks) time-series (throughout six years) panel data, I had a few choices in the regression models I could use: pooled OLS, random effects fixed effects models. I also conducted Breusch Pagan, Wooldridge and Hausman tests to decide which model best suits my dataset.

For the first category, my idea was to test if the banks that lost more during the crisis were also mostly the banks with the larger size of total assets. Then whether they increased their restricted shares and decreased the options as a percentage of the CEOs' compensation package post vs. prior to the crisis, in a way, could be aligned with the difference-in-difference concept. I used six years to capture the period, including the initial phases of the crisis, during and slightly after it.

I test the relationship between a market-based measure of bank losses in the Great Financial Crisis and two components of the CEO compensation with firm-specific and year-specific fixed effects. Ultimately, I test the relationship between the bank compensation structures and losses in the crisis and the bank indicators of short-termism and long-termism with the firm and year-specific fixed effects. As suggested by the empirical evidence, I found it proper to test if the banks that experienced the greatest losses in the 2008 recession had a significant increase in the percent of restricted stock and a decrease in the percent of options in the executive compensation package. The second model is centered around the idea that banks that have lost the most adjusted their assets and liabilities to align them better to long-term horizons. With this mechanism, I link the executive compensation to short-termism, controlling for other effects that might be influencing this relationship.

For my sample size, I included 94 bank holding companies in the US (BHCs), both medium-sized and large, to introduce a variety in my sample and make it more predictive of the population. I have gotten this list from the Federal Reserve stat issue of insured U.S. commercial banks with consolidated total assets of 300 mn USD and higher released on March 31st, 2006. These banks were significant for the US as well as the global economy. Due to the limitations of the database I used to collect the data for compensation (S&P Capital IQ), I was obliged to manually investigate whether each bank was public throughout my focus period. This was essential because some of my control variables were based on the market parameters. (Federal Reserve, 2006)

In addition, as mentioned in the literature section, the regulation that addresses executive compensation is applied to all public companies making it a mandatory requirement for my sample. Additionally, I manually examined whether each bank of the sample remained in the same form and did not merge with another bank and whether it failed or changed the name or ticker. Therefore, due to these constraints, I have included 94 banks in my sample for analysis and I believe this is a high enough number to draw significant conclusions.

Since I intended to compare the pre-crisis periods to the periods during and after it, I focused on the years 2006-2011, of which years 2006-2007 were before the crisis, 2008-2009 during and 2010-2011 after the crisis. To ensure my timeline is correct, I compared different sources; most of the more credible ones overlap. One might argue that since the crisis came to effect already in the later stages of 2007, including this year as one prior to the crisis would not be an ideal solution. However, I believe that the full effects of the crisis that my variables capture only started showing significance in 2008, marking the beginning of the real crisis. Nevertheless, for my dummy variable, which will be discussed later, I am primarily interested

in comparing the period prior to and during the post-recession period. (Financial crisis: Timeline, 2012)

I will now discuss the variables I gathered for my model and how I collected them. Following Chen et al. (2006), I construct the *RESTRICTED* shares and *OPTIONS* as a percentage of total CEO compensation. I use the S&P Capital IQ database to acquire the information from the compensation summed table of each year's proxy statement. The SEC disclosure rules require that such a table contain the value of restricted shares and options awards expensed in the year of focus, i.e., the USD amount of the value of the restricted stock and options each CEO has gained in that year. The disclosure standards for all publicly traded financial institutions of my sample was uniform, making it easier to draw comparable analysis.

Since my focus is on performance-based compensation, similarly to Bebchuk et al. (2009), I exclude the executives' base salary (cash) from the analysis. In addition to this, other available compensation components on the S&P Capital IQ that I excluded were a non-equity incentive plan, change in a pension plan, estimated payments in case of termination or change of control and other annual compensation. These categories are not a part of the equity-based compensation, therefore of little relevance to my research question. Additionally, I recognize the skewness of restricted and option holdings on their own, which is why the ratio of option and restricted shares, respectively, to other compensation, is not desirable and would result in extreme outliers. (Cornett et al., 2009)

One of my most significant variables was *RESTRICTED*, the USD value of restricted stocks divided by the total USD value of the CEO compensations reported that specific year. Essentially, the restricted shares are handed out by the employers to give workers an additional stake in the company, which grows as the business grows. The grant is "restricted" because it is limited by additional restrictions on transfers or sales that the employer may impose, is subject to a vesting schedule that may be based on the duration of employment or performance goals, and is subject to other vesting requirements. (Simon, n.d)

Similarly, I have constructed *OPTIONS* which is the USD value of the options possessed divided by the dollar value of the total compensation. To acquire data, I have entered the ticker of banks from the mentioned list, selected the compensation statistics, filtered for the mentioned years and exported the main components of the compensation package. To test whether the data from S&P Capital IQ was referencing the correct proxy statements from the correct years, I examined data from five randomly-selected banks from my sample during two randomly-selected years, and they did match. Additionally, I had to manually consolidate the

data from Capital IQ in the following way. The compensation report displayed the numbers by employee's name and not the title; thus, for the banks that changed their CEOs during the sample period, there would be two or more employees with the title CEO. Therefore, I needed to go through every bank's yearly proxy statement, look for that year's CEO's full name, and create a consolidated table with all of the bank's CEO data for 2006-2011.

Apart from the compensation variables, I have developed the primary independent variable - a market-based proxy for bank losses, *LOGDIF*. I have considered including a measure of losses similar to the one that Santos (2010) used. He developed the *CHARGEOFFS* variable, which is essentially the ratio of the bank's net charge-offs to total assets prior to the loan date. *Net charge-offs* are the dollar amounts which are the difference between charge-offs (gross amount of debt not repaid to the bank) and any subsequent debt recoveries. However, I believe that, since I am referring to the banks during the great recession and investigating the effects of CEO compensation (tied to the share price), I find it more appropriate to use a market-based proxy of losses.

Therefore, following Tong and Wei's (2010) work, I developed *LOGDIF*. Their model defined it for manufacturing firms as the difference of natural logarithms of stock prices from the end of June'07 to the end of December'08. They had to stop in December due to the data availability during their research. However, I extend my analysis until the end of March 2009 as it included a period of the lowest points in the crisis for many banks as their stock prices hit unprecedented lows. Therefore, my *LOGDIF* variable is $\log(\text{the price of the stock of bank A on 30.06.2006}) - \log(\text{the price of the stock of bank A on 31.03.2009})$. The stock prices are from The center for research in security prices (CRSP) and filtered for monthly adjusted closing price data. I excluded the rest of the months from my analysis and kept the two abovementioned to develop my proxy variable.

To capture whether there is an effect in the specific post-crisis years - 2010 to 2011, I included a dummy variable *POST*. Essentially, the value of this dummy is 1 for years after the crisis 2010-2011 and 0 for years prior and during 2006-2009. Although the crisis was mainly in 2008, I included 2009 year-end data as well since in that year, we witnessed the most significant decrease in stock prices and the recession lasted until about June. Upon that, I created the interaction variable *LOGDIF_POST*, which is the variable *LOGDIF* multiplied by *POST*. The presence of an interaction variable implies that the impact of one independent variable on the dependent variable is different, deepening which value another crucial independent variable has. This way, I captured the effect of losses to the options and restricted shares compensation before (and during) vs. after the crisis. In other words, I tested whether

the banks that have lost more have increased or decreased their restricted shares or options as a part of the total compensation package post-crisis.

The control variables I used were crucial to controlling for some common bank characteristics that could bias my sample if not accounted for. *LOGCAP* is one of them and it represents the logarithm of market capitalisation. I used it to control the bank size. Larger banks are under a giant microscope from industry analysts and regulators and thus are more likely to be the subjects of enforceable measures that would impact the relationship between my primary independent variable and the dependent variable. In order to align the data with the rest of the variables which come in the yearly form (such as the executive compensation), I have averaged the monthly bank stock price and the number of shares outstanding to create yearly proxies. This way, I got an average yearly market capitalisation.

Similarly to the *LOGDIF* variable, I used the logarithm of the market capitalisation to normalise for the significant discrepancies in values and make them more easily comparable. I have obtained the monthly number of shares outstanding from the CRSP database. Another variable I constructed to control bank size was *LOGAST*, which is a log of total assets obtained from the mentioned balance sheets. Unlike the *LOGCAP*, *LOGAST* is not a market-based measure of how large a bank is; therefore, *LOGCAP* would better fit my model if compared between them. Nevertheless, I included both initially. As for controlling for general stock price volatility that might be independent of any factors analysed in my paper, I constructed volatility (*VOL*) which is the st deviation of the share price for every bank. I used the monthly stock price data and calculated the standard deviation for each year for every bank in the sample.

Another control variable I added was the market to book – *MB* ratio as a proxy of growth prospects. Executives of growth companies frequently gain stock and option compensation as a part of their package. Santos (2010) also adds the *MB* variable to his model and defines it as a proxy for the worth that the firm is predicted to obtain from growth in the future. This variable is defined as the total value (market) of equity at the end of a particular year divided by the total book value of equity at the year-end. It essentially shows whether a bank is overvalued – a score over one means it is overvalued and under one under-valuated. For the book value, I calculated from the balance sheet data I obtained from the Refinitiv Datastream platform. It is total assets minus total liabilities as reported in the annual financial statements. (Cornett et al., 2008)

As suggested by Bergstresser and Philippon (2006), controlling for size (*LOGCAP* or *LOGAST*), volatility (*VOL*) and market-to-book ratio (*MB*) implies that my results are not

driven by the more volatile operating environments of banks that use significant amounts of stock and option-based compensation but are instead tied to the parameters I have described in the previous sections.

Additionally, I use LEVRAT – leverage ratio, which was calculated as bank debt total equity extracted from the Refinitiv Datastream balance sheets. I added this one to control for the bank's capitalisation in terms of debt vs. equity. Finally, following the work of Cerasi et al. (2020), I included both the (*ROA*) and return on equity (*ROE*) control variables which help control for bank profitability.

Apart from the abovementioned independent, dependent and control variables, I have constructed one more dependent variable for my fourth and fifth model to capture the effect of restricted shares and options on long-termism. That variable is *LONGASSET* and I seized it by analysing the balance sheet of banks, to be more precise, the short-term assets on the asset side to develop a proxy for long-termism. I believe that the banks that increase the percentage of short-term assets signal that they are more short-term oriented with a shorter investment horizon. I have constructed the *LONGASSET* variable by adding the short-term assets on the balance sheet, subtracting them from total assets and then dividing this difference by the total assets. I used this method due to increased efficiency in data collection, as there were fewer categories of short-term assets than long-term. The short-term assets I selected were all that had the maturity of under a year: the fed funds sold and security purchases, trading account assets and total investment securities.

Lastly, to control for some unobserved differences among banks (or so-called firm effects) that I have not captured, I mapped each bank by its ticker and attached a number from 1 to 94 for each bank. Therefore, for each bank, there would be a set of integers corresponding to each. Upon this, I created a dummy variable that represents the value of 1 for one specific bank of the sample and 0 for all others. Similarly, I have created a dummy for each year to control for the year effects, more precisely, some fundamental changes from one year to another that I have not accounted for, which would bias my sample immensely.

Now that I have explained how I created each variable, I will discuss the data itself. The most practical way to combine the different datasets I collected was by organising them into a panel format, combining cross-sectional and time series. This method is the best fitting since I am capturing different variables across institutions and throughout the years. This format is also called longitudinal format. I discuss the formats and choices of regression types more below but firstly, I present the main hypotheses I have developed based on empirical and theoretical research.

3.2 Hypotheses:

Now that I have followed the empirical findings and my general research question, I have developed the following hypotheses:

1. Ho: The **bank size** had no effect on how much banks lost in the crisis
2. Ho: The **bank losses** have no effect on how **restricted shares** changed as a percentage of the CEO compensation package after the crisis
3. Ho: The **bank losses** have no effect on how **options** changed as a percentage of the CEO compensation package after the crisis
4. Ho: The **options** as a percentage of the CEO compensation package have no effect on the **long-term assets** as a percentage of total liabilities.
5. Ho: The **restricted shares** as a percentage of the CEO compensation have no effect on the **long-term assets** as a percentage of total liabilities.

3.3 Summary Statistic and Correlation:

My dataset looks as follows when summarised:

Variable	Obs	Mean	Std. Dev.	Min	Max
tic_id	564	47.5	27.15801	1	94
bank	0				
year	564	2008.5	1.709341	2006	2011
restricted	564	.1930564	.1998484	0	.9908259
options	564	.106997	.1657232	-.0316085	.9950319
mb	564	1.507376	1.929937	-6.622485	34.40137
logcap	564	9.235991	1.034075	0	11.35249
logast	564	10.16926	.8135099	7.951338	12.35522
vol	564	3.925023	5.218357	0	43.26517
levrat	564	1.466203	2.134078	-5.444676	25.101
longasset	563	.2430714	.1465951	0	.9402985
ROA	564	.0572163	.4194527	-.4876876	6.783356
ROE	563	.5021263	3.539029	-1.957227	54.60473
logdif_post	564	.1120931	.2327855	-.2702694	1.57574

Correlation matrix:

	restric~d	options	mb	logcap	logast	vol	levrat	longas~t	ROA	ROE
restricted	1.0000									
options	-0.0734	1.0000								
mb	0.1082	0.0192	1.0000							
logcap	0.2259	0.3297	0.1110	1.0000						
logast	0.2413	0.3321	-0.1498	<u>0.7128</u>	1.0000					
vol	0.0475	0.0540	-0.0372	0.1642	0.2713	1.0000				
levrat	0.1492	0.1614	0.4225	0.3352	0.4503	0.2668	1.0000			
longasset	0.1149	-0.0434	0.1196	0.0534	0.0166	0.0015	0.2515	1.0000		
ROA	0.0425	0.0218	0.0000	0.0429	0.0599	-0.0163	-0.0275	-0.0349	1.0000	
ROE	0.0353	0.0132	-0.0031	0.0419	0.0671	-0.0086	-0.0123	-0.0381	<u>0.9859</u>	1.0000

The issue of multicollinearity essentially happens when two or more pairs of independent variables are correlated in the sample. This was important to test to prevent biased results in the OLS model. As shown in summary above, I have used the simple corr function in STATA. The underlined are above the general threshold of correlation used widely in studies - approximately 0,7. The highest correlation was between ROA and ROE, which was 0,99. Another high correlation was 0,71 between LOGCAP and LOGAST.

In order to mitigate the possible bias, I have excluded one from each pair of correlated variables. My justification was the following. Since the LOGAST is highly correlated with LOGCAP, I excluded it simply because I believe that the market-based proxy for bank size fits my study better than a book value-based one. Since I must choose one over the other, I believe that the log of market capitalisation along with the market-to-book ratio is a good enough control for size. ROA and ROE are highly correlated since both have the same net income numerator. I have tested all of the models substituting ROE with ROA and found that they lead to similar R-squares. Therefore, I chose to include ROA since it provided a slightly higher R-square than most models.

3.4 Regression Models

To test Hypothesis 1, I have developed Model 1: bank losses post-crisis = adjusted total assets + control variables. Formally, the equation is $LOGDIF_POST = \beta_0 + \beta_1 LOGAST + \beta_2 MB + \beta_3 LOGCAP + \beta_4 VOL + \beta_5 LEVRAT + \beta_6 ROA + \beta_7 YR + \beta_8 ID + \varepsilon$. Where β_0 is the intercept, β_n are the coefficients and ε in this model and the following ones represent the residual or the standard error (SE) of the regression, which captures the variance in the model not explained by the independent variables. Based on my hypothesis, I expected to reject the null, i.e., the variable *LOGAST* would have a statistically significant effect

on *LOGDIF_POST*. In addition, I expect the *LOGAST* to have a positive beta coefficient since that would suggest that the larger the banks were in the crisis, the greater the losses they experienced. This regression is not central to my story but is simply there to confirm that my data represents the population of banks well and produces outcomes that align with the empirical and theoretical research that proceeded them. Given the sample of a diverse set of banks in terms of total assets, we could witness that the most significant banks indeed produced tremendous losses if the variable shows significance.

To test Hypothesis 2, I have developed Model 2: restricted shares = bank loss post-crisis + control variables. Formally, the equation is: $RESTRICTED = \beta_0 + \beta_1 LOGDIF_POST + \beta_2 MB + \beta_3 LOGCAP + \beta_4 VOL + \beta_5 LEVRAT + \beta_6 ROA + \beta_7 YR + \beta_8 ID + \varepsilon$. Where β_0 is the intercept, β_n is the coefficients and ε in this model and the following ones represent the residual or the standard error of the regression, which captures the variance in the model not explained by the independent variables. Based on my hypothesis, I expected to reject the null, i.e., the variable *LOGDIF_POST* would have statistically significant effect on *RESTRICTED*. In addition, I expect the *LOGDIF_POST* to have a positive beta coefficient (positive effect on restricted shares variable) since that would suggest that restricted shares have increased as a percent of the compensation package post-crisis for the banks that experienced greater losses.

The third hypothesis is tested in Model 3: options = bank loss post-crisis + control variables. Formally: $OPTIONS = \beta_0 + \beta_1 LOGDIF_POST + \beta_2 MB + \beta_3 LOGCAP + \beta_4 VOL + \beta_5 LEVRAT + \beta_6 ROA + \beta_7 YR + \beta_8 ID + \varepsilon$. I predicted that I would reject my null hypothesis, i.e., the variable *LOGDIF_POST* would have a statistically significant effect on *OPTIONS* and that the beta coefficient of *LOGDIF_POST* would be negative. This would imply that options have decreased as a percent of the total compensation package post-crisis among the banks that experienced greater losses. This would align with what I have developed as an expectation from investigating related research.

The fourth hypothesis is tested in Model 4: long-term assets = options + control variables. Formally: $LONGASSET = \beta_0 + \beta_1 OPTIONS + \beta_2 MB + \beta_3 LOGCAP + \beta_4 VOL + \beta_5 LEVRAT + \beta_6 ROA + \beta_7 YR + \beta_8 ID + \varepsilon$. I predicted that I would reject the null hypothesis, i.e., the variable *OPTIONS* would have a statistically significant effect on *LONGASSET* and that its coefficient would be negative. The reason for this is that the banks with more options as a percentage of the total compensation of their CEOs decrease their investment horizon (long-termism), which I have attempted to verify in this research.

The fifth hypothesis is tested in Model 5: long-term assets = restricted shares + control variables. Formally: $LONGASSET = \beta_0 + \beta_1 RESTRICED + \beta_2 MB + \beta_3 LOGCAP + \beta_4 VOL + \beta_5 LEVRAT + \beta_6 ROA + \beta_7 YR + \beta_8 ID + \varepsilon$. I predicted that I would reject the null hypothesis, i.e., the variable *RESTRICED* would have a statistically significant effect on *LONGASSET* and that its coefficient would be positive. I expected this because it would imply that the banks with more restricted shares as a percentage of the total compensation of their CEOs increase their investment horizon (long-termism), which aligns with what I have presented thus far from theory and findings from other studies.

4 Results

4.1 Methods and Diagnostic Tests:

Before presenting more details on my models, I need to address some of the main reasons I used the panel data format over cross-sectional or time series. First, panel data provides more degrees of freedom, making the conclusions from results more credible (accurate). Another is that it provides a greater possibility to control for possible omitted variables, which could bias my results. Also, it has a greater capacity to discover dynamic relationships while having more accurate predictions for individual outcomes. Lastly, panel data's ability to provide a solid foundation for aggregate data analysis while offering simplified computation and statistical inference is highly beneficial. (Tsonas, 2019)

Prior to conducting my regression analysis, I have researched different methods and performed a few tests to see what best fits my data looking from both a theoretical and statistical lens. Additionally, I avoided any significant biases that could affect my model and its conclusions. I have also conducted the most widely-used tests to decide among several regression methods for analysing longitudinal panel data. My main options included pooled ordinary least squares (OLS), random effects and fixed effects regressions. In order to test which is most appropriate for my model, I used the Breusch-Pagan, Wooldridge and Hausman tests.

The pooled OLS model; however, I believe that this method is not ideal for my specific study since it does not control for the unobserved firm (bank)-specific effects. I could potentially mitigate this issue by creating a dummy variable for each year and bank, which I ultimately did to perform the tests discussed in the following section. However, while this would be recognizing that each bank is different, it does not necessarily mitigate the bias to

the extent that the other two models do. Additionally, since my sample is large – 94 banks, creating 94 dummy variables is not practical in displaying the results of the OLS regression.

The fixed effects model controls for the unobserved heterogeneities, in my case, the unique unobserved characteristics for each bank in my sample that might not be captured by the control variables I have chosen. The fixed effects model takes repeated observations of each population. The means are then estimated. Finally, the hypotheses regarding parametric functions (linear) are tested, most commonly with the test of equality of all means. In addition, the random variables and the sampling approach could also be plausible, where the variance of the population of means and variance of errors are estimated. (Mundlak & Yahav, 1981)

The random-effects model also captures these unobserved characteristics; however, the difference from the fixed effects is that it does not eliminate the variables that are constant through time. Occasionally, the unobserved heterogeneity can depend on itself, making the time and past observations relevant for each unique observation (serial correlation). In this case, pooled OLS is not an appropriate choice because the serial correlation would not be considered. On the other hand, random effects regression can be used even in heterogeneity. For this reason, I used the Wooldridge test to examine whether there is some sort of serial correlation in my dataset or not to help me choose the most appropriate model.

4.1.1 Breusch-Pagan Test

Breusch-Pagan test (BP) essentially determines whether heteroscedasticity is present in a linear regression model or not. The most widely used explanation for heteroskedasticity is when the variance of the dependent variable is inconsistent across the range of independent variables, therefore making any estimation with the OLS method biased. The null hypothesis of the BP test is that there is no heteroskedasticity.

Initially, I simply uploaded my dataset into STATA and did not declare it as panel data. For every model, I first conducted the standard OLS regression along with all independent, control and dummy variables (i.tic_id as a dummy for each bank and i.year as a dummy for each year). Then I performed the BP test, which essentially regresses the square fitted residual with each independent variable. The dependant variables, therefore, were not included in the test. The following were the results:

Model1:

```
. hettest logast mb logcap vol levrat ROA i.tic_id i.year

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: logast mb logcap vol levrat ROA i.tic_id i.year

chi2(104)    = 1321.22
Prob > chi2   = 0.0000
```

Model3:

```
. hettest logdif_post mb logcap vol levrat ROA i.tic_id i.year

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: logdif_post mb logcap vol levrat ROA i.tic_id i.year

chi2(104)    = 887.93
Prob > chi2   = 0.0000
```

Model5:

```
. hettest restricted mb logcap vol levrat ROA i.tic_id i.year

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: restricted mb logcap vol levrat ROA i.tic_id i.year

chi2(104)    = 592.37
Prob > chi2   = 0.0000
```

Model2:

```
. hettest logdif_post mb logcap vol levrat ROA i.tic_id i.year

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: logdif_post mb logcap vol levrat ROA i.tic_id i.year

chi2(104)    = 2877.84
Prob > chi2   = 0.0000
```

Model4:

```
. hettest options mb logcap vol levrat ROA i.tic_id i.year

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: options mb logcap vol levrat ROA i.tic_id i.year

chi2(104)    = 586.72
Prob > chi2   = 0.0000
```

I did the same procedure for all five of my models, and since chi2 values are high for all five models, I reject the null hypotheses and conclude that heteroskedasticity is, in fact, present in all of my models. This is not a surprise as my sample is full of outliers and some omitted variable potentially. For this reason, the pooled OLS would not be the best choice for my regression but rather fixed or random effects models.

4.1.2 Wooldridge Test

To confirm that the fixed or random effects model would be more appropriate for my data, I examined an important factor that I need to control for - the abovementioned serial correlation. It will bias my sample if the regression method is OLS if not accounted for. The test that is relevant for this is the Wooldridge test. Its null hypothesis is that there are no first-order autocorrelations in the data. I first did the regular OLS regressions for all five of my models and then included the formula tx serial for serial correlation. The results of the tests were as follows:

Model1:

```
. xtserial logdif_post logast mb logcap vol levrat ROA

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F( 1, 93) = 2220.523
Prob > F = 0.0000
```

Model3:

```
. xtserial options logdif_post mb logcap vol levrat ROA

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F( 1, 93) = 0.703
Prob > F = 0.4040
```

Model5:

```
. xtserial longasset options mb logcap vol levrat ROA

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F( 1, 93) = 38.134
Prob > F = 0.0000
```

In models 2 and 3, I fail to reject the null. Therefore, there is no first-order autocorrelation. However, models 1, 3 and I rejected the null and concluded that there is, in fact, first-order autocorrelation. In order to ensure this does not bias my results, I find it most appropriate to use either a random effects or a fixed effects model with robust standard errors; in this case, two different tests confirm those options.

4.1.3 Hausman Test

Lastly, I did the Hausman test to decide whether fixed or random effects are the appropriate methods for my paper. The null hypothesis of this one is that the difference in coefficients is not systematic, i.e., if we reject the null, the fixed effects model is more appropriate. The results were as follows:

Model1:

```
Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 89.66
Prob>chi2 = 0.0000
```

Model3:

```
Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 19.65
Prob>chi2 = 0.0032
```

Model2:

```
. xtserial restricted logdif_post mb logcap vol levrat ROA

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F( 1, 93) = 2.154
Prob > F = 0.1456
```

Model4:

```
. xtserial longasset restricted mb logcap vol levrat ROA

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F( 1, 93) = 39.834
Prob > F = 0.0000
```

Model2:

```
Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 21.16
Prob>chi2 = 0.0017
```

Model4:

```
Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 23.91
Prob>chi2 = 0.0005
```

Model5:

Test: Ho: difference in coefficients not systematic

```
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
        =      41.73
Prob>chi2 =      0.0000
```

In accordance with the above, I rejected the null hypothesis in all five models; thus, the fixed effects model is my model of choice for all five of my models. (Wiggins & Poi, n.d.)

4.2 Outcome:

Before presenting the results and discussing their meaning, I need to emphasize that I controlled heteroskedasticity and multicollinearity by conducting the fixed regression with the `vce(robust)` function in STATA to obtain unbiased robust standard errors. The robust standard error (SE) is used to create unbiased standard errors in the wake of heteroskedasticity. I identified the model as a panel (`xtset` function) with `tic_id` as the cross-sectional and year as a time dimension. For all five of my regressions, I used the `xtreg` variable names, `fe vce(robust)` function. Here is the regression of the output of all five of my models:

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5
logdif_post		0.151*** (0.0444)	-0.132*** (0.0272)		
mb	0.0230 (0.0167)	-0.0233* (0.0130)	-0.00667 (0.00616)	0.00643 (0.00396)	0.00695* (0.00411)
logcap	-0.0334*** (0.0113)	0.0124 (0.0112)	0.00861* (0.00440)	0.00292 (0.00278)	0.00239 (0.00283)
vol	-0.0186*** (0.00448)	0.00407 (0.00329)	0.00137 (0.00170)	-0.000587 (0.000720)	-0.000777 (0.000728)
levrat	-0.0490** (0.0201)	0.0350** (0.0158)	0.0135* (0.00798)	-0.00385 (0.00490)	-0.00493 (0.00510)
ROA	0.0139 (0.0191)	0.00465 (0.00603)	-0.0294** (0.0117)	-0.000855 (0.00515)	0.000638 (0.00563)
options				-0.0486** (0.0205)	
restricted					0.00910 (0.0157)
logast	0.797*** (0.158)				
Constant	-7.572*** (1.567)	0.0293 (0.104)	0.0288 (0.0416)	0.220*** (0.0263)	0.219*** (0.0270)

Standard Errors in brackets
 *** p < 0,01 ; ** p < 0,05 ; * p < 0,1

The first model ($LOGDIF_POST = LOGAST + \text{control variables}$) shows much significance in the primary independent variable. The main independent variable, the log of total assets, has a very high t-statistic of 5,06 and, therefore, a very low p-value that is not visible since the rounded three decimals show only zeros. This statistically significant variable's coefficient has a positive sign and magnitude of about 0,8. This means that with a 1% increase in the total assets, the losses increase by about 0,8%. This is not unexpected as it was widely reported during and after the crises that the largest banks suffered massive losses in the period during and slightly after the recession. I used the percentages in the interpretation as both dependent and independent variables are log-transformed. Although, in this model, the log of market capitalisation, volatility and leverage ratio are highly significant, they are the control variables; hence, I will not comment on their meaning of them in this or any of the following models.

The second model ($RESTRICTED = LOGDIF_POST + \text{control variables}$) shows much significance in the main independent variable, the interaction variable between the losses and post-crisis dummy. The t-statistic is 3,39 and p-value 0,001. We can interpret the relationship as a one percent increase in the losses resulting in a 0,15 percent increase in restricted shares as a part of total compensation for the period post-crisis (important to note that the variable restricted is in terms of percentages by default setting). This aligns well with my findings from prior research and indicates that the banks have made changes in a more conservative way when it comes to CEO compensation post-crisis, at least the banks that lost the most.

The third model ($OPTIONS = LOGDIF_POST + \text{control variables}$) shows significance in the target-independent variable. The interaction variable of bank losses and the dummy has a very high t-statistic in the absolute value -4,86 and, therefore, a very low p-value that is not visible since the rounded three decimals show are, again, only zeros. I interpreted this model in the following way. A one percent increase in the losses (log-transformed) resulted in a 0,13 percent decrease in options as the percent of total compensation post-crisis. Again, this is well aligned with my story as the options are considered riskier and triggering of impulse, short-term reactions with little consideration to the overall stability of a bank and broader financial system.

The fourth model ($LONGASSET = OPTIONS + \text{control variables}$) includes options as the independent variable and long-term assets as the dependent variable. The options variable is a statistically significant predictor of variability in the long-term assets with a negative coefficient. The variable can be interpreted the following way: one unit increase in options (as a percent of the total compensation) decreases the long-term assets (as a percent of total

assets) by 0.048 percent. It implies that a 1% increase in options decreases the total assets by 0.048%. This number could appear low; however, we must remember that the banks' assets are enormous figures; thus, even percentages such as this one can have an enormous impact. To put things in perspective, the total assets I categorised as long-term for JPMorgan Chase were USD 673.236 billion or 49.8132% of total assets. Now, if the percentage decreases by 0.048% to 49.765%, we now have USD 648.732 billion or 650mn USD less than before. Nevertheless, the data supports my hypothesis that options indicate more short-term horizon, in this case, the percentage of the short-term assets held on the balance sheet.

Finally, the fifth model ($LONGASSET = RESTRICTED + \text{control variables}$) shows no sign of the effect of the restricted shares variable. On its own, it cannot explain the variation in long-term assets on a significant level. Therefore, according to my model, I cannot conclude whether the banks that have increased the restricted shares have adjusted their long-term assets significantly. Therefore, I fail to reject H_0 and draw conclusions from this model.

5 Conclusion

My results reveal that the relationship of my main variables was, in fact, significant in four out of five models. I show evidence that the banks that endured the most significant losses were among the largest in terms of assets, which supports the general idea that the banks that created the tremendous losses to the US and global economy were the most significant ones. However, I found that these banks have increased the restricted shares and decreased options as a percentage of total CEO compensation post-crisis. If we are to agree with the prior research in stating that these two measures are indicative of the bank's overall strategy in terms of riskiness and investment horizon, we can say that the banks have "learned from the crisis" and increased the more long-termism aligned type of compensation and decreased the more risky, short-termism aligned one. Nevertheless, I need to acknowledge that my fifth model reveals that, possibly, restricted shares might not be as clearly indicative of long-termism, at least in my sample, which does not need to mean that they are not in general indicative. It simply outlines that I was not able to prove this relationship.

The underlying cause of these changes in the compensation structures was outside the scope of my thesis. I have eliminated the option of primary federal regulation, the Dodd-Frank Act, as being the trigger, but I have not examined other factors such as the board involvement and decision-making within the banks, typical CEO characteristics such as age

and years of experience. For these, I have not had the capacity; however, I do not find this a problem since my fixed effects model was tailored to control for the unobserved variabilities among the 94 banks in my sample.

One of the limitations of my work is the access to the appropriate databases that would make my data collection faster and I could have collected more of the banks for my sample. Nevertheless, I believe my sample is very representative in terms of including both large and comparably smaller banks. My access to the S&P Capital IQ allowed me to collect data for the different components of the executive compensation package. However, for each bank, I needed to examine if they were listed, whether they operated throughout the focus period or were acquired, and whether the CEO remained the same from 2006 to 2011. I needed to make any manual adjustments to the reported study. Nevertheless, I believe I have produced significant findings despite all such adversity.

This study is important, and further studies of similar nature need to be done because we still have a large percentage of the banks with executives having a very high percentage of their salaries in options and restricted stock. Executives are human beings who sometimes do not behave rationally and are subject to the moral hazard effect due to the desire to collect the most profit. Therefore, a direction in which the extension of my work can go is examining the systems put in place by the board for example, to mitigate these moral hazard effects in recent years.

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Abstract

The financial crisis in 2007-2008 caused significant losses due to the similarity in business models of the largest US banks that were also globally systemically important. Therefore, investigating any components of that downfall is crucial for learning from the mistakes and building a more resilient global financial system. One of these components, the main focus of this thesis, is the equity-based bank CEO compensation and its effects on bank short-termism among US banks. I developed a series of variables capturing the compensation side as well as losses, long-term and control variables to help fix some factors that could bias my estimations. I conducted five fixed effects estimation models, and my findings are the following. The banks that lost more in the crisis were the more prominent (more significant) banks. The percentage of shares as a part of total compensation increased post-crisis for the banks that lost the most in the crisis. The opposite was the case with options. Lastly, I found that while banks with higher options CEO compensation tend to have less long-term assets, no significant relationship was found between restricted shares and long-term assets.

Zusammenfassung

Die Finanzkrise von 2007-2008 verursachte aufgrund der Ähnlichkeit der Geschäftsmodelle der größten US-Banken, die auch global systemrelevant waren, erhebliche Verluste. Daher ist die Untersuchung aller Komponenten dieses Zusammenbruchs entscheidend, um aus den Fehlern zu lernen und ein widerstandsfähigeres globales Finanzsystem aufzubauen. Eine dieser Komponenten, auf die sich diese Arbeit konzentriert, ist die aktienbasierte Vergütung der CEOs von Banken und ihre Auswirkungen auf die Kurzfristigkeit der US-Banken. Ich habe eine Reihe von Variablen entwickelt, die die Vergütungsseite sowie Verluste, langfristige und Kontrollvariablen erfassen, um einige Faktoren zu korrigieren, die meine Schätzungen verzerren könnten. Ich habe fünf Schätzmodelle mit festen Effekten durchgeführt und bin zu folgenden Ergebnissen gekommen. Die Banken, die in der Krise mehr verloren haben, waren die prominenteren (bedeutenderen) Banken. Der prozentuale Anteil der Aktien an der Gesamtvergütung stieg nach der Krise bei den Banken, die in der Krise am meisten verloren haben. Bei den Optionen war das Gegenteil der Fall. Schließlich stellte ich fest, dass Banken mit einer höheren CEO-Vergütung in Form von Optionen zwar tendenziell weniger langfristige Vermögenswerte haben, aber kein signifikanter Zusammenhang zwischen Aktien mit Verfügungsbeschränkung und langfristigen Vermögenswerten gefunden wurde.