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Management Incentives and Corporate Strategies of Banks

Alberto Razul

Doutoramento em Gestão, na especialidade em Estratégia e Empreendedorismo

Orientador:
[Professor Doutor] [Mohamed Azzim Gulamhussen], [Professor Catedrático],
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ABSTRACT

This study analyzes the risks affecting the managerial process of the banking sector and the corresponding strategies. The study addresses the incentives pay in banks, namely bonus, stock and options. A comparative study of stock and options is made in chapter 3, based on the John, Saunders and Senbet (2000) and Stoughton and Wong (2003) models; and chapter 4 compares the risk related advantages of using bonus and options in managerial pay, based on the Cerasi and Oliviero (2015) model. Chapter 5 analyzes the managerial pay in 46 of the world's 100 largest banks in early 2017 based on their reports from FY2005 and FY2015.

The results indicate options as an important variable that helps optimizing the volume of incentives, in addition to their incentivizing role for managers, although all incentives have been very few used. Concerning the risk related advantages of using bonus and options, bonuses require additional shareholders' inspection to the manager's activities that allows immediate intervention in order to reverse harmful effects of poor performance, while options establish an alignment of interests between the parties; bonuses have a lowering effect of the shareholders' income expectations while options do not; and bonuses create a pressure on the manager and threat him(her) to eviction, while options create safety conditions for the manager to act in a relaxed, however responsible and independent way.

Concerning the empirical study, the incentives were very less used, thus not fully validating the models. The model results were about 50% close to the actual ones.

JEL Codes: D82; G20; L10

Keywords: Incentives; Banks; Firm Strategy and Performance

RESUMO

Este estudo analisa os riscos que afectam o processo de gestão do setor bancário e as correspondentes estratégias. O estudo aborda o pagamento dos incentivos bônus, acções e opções nos bancos. Um estudo comparativo de acções e opções é feito no capítulo 3, em busca do seu ponto de equilíbrio, baseado no modelo de John, Saunders e Senbet (2000), conjugado com o de Stoughton e Wong (2003); o capítulo 4 compara as vantagens relacionadas ao risco do uso de bônus e opções, baseado no modelo de Cerasi e Oliviero (2015). O capítulo 5 analisa o pagamento dos executivos de 46 dos 100 maiores bancos do mundo em inícios de 2017, com base nos seus relatórios dos Anos Fiscais de 2005 e de 2015, e mede o nível de uso de incentivos, nomeadamente, bônus, ações e opções.

As conclusões deste estudo indicam que opções são uma variável importante para a optimização do volume dos incentivos, para além do seu papel incentivador para os gestores e de outras utilidades. Em relação às vantagens relacionadas ao risco de usar bônus e opções, bónus requer inspecção adicional dos accionistas aos gestores, tem efeito redutor das expectativas de lucro dos accionistas e cria pressão sobre os gestores, enquanto as opções têm efeito contrário, com resultados semelhantes ou ainda melhores.

Em relação ao estudo empírico, os incentivos aqui aflorados foram muito pouco utilizados, o que dificultou a validação robusta dos modelos propostos. Os resultados dos modelos estiveram próximos dos reais em cerca de metade dos casos.

Classificação JEL: D82; G20; L10

Palavras Chave: Incentives; Banks; Firm Strategy and Performance

EXECUTIVE SUMMARY

The agency problem and its relief are the main concern of any company and its approach is differentiated according to some factors such as type, size, and age of the company. By the factor "type", firms can be divided into two main categories: financial and non-financial. Much research has been done on this subject, discussing the different ways suggested to alleviate the agency problem, especially the managers pay. This is done mainly by creating some incentives that should increase the manager's performance, while reducing the risks of the business.

Thus, under the concern *"how different pay modes can help alleviate the agency problem?"*, and from the performance perspective, this study analyzes the risks affecting the managerial process of the banking sector. Bank managers are pied according to a pay-for-performance scheme and their effort is not observable by depositors and shareholders. The study is centered on three incentives, namely stock, options and bonuses.

A comparative study of stock and options is made in chapter 3, seeking their balance, based on the John, Saunders and Senbet (2000) model and Stoughton and Wong (2003) model; and chapter 4 compares the risk related advantages of using bonus and options in managerial pay, based on the Cerasi and Oliviero (2015) model. In chapter 5 the study analyzes the managerial pay in 46 of the world's 100 largest banks in early 2017 based on their reports from FY2005 and FY2015, and measures the level of the use of the analyzed incentives, bonuses, stock and options, to compose the managers' pay.

The results indicate that both models are applicable in the banking sector, although this sector has some specificity that makes the use of the chosen incentives less intensive, mainly options, in a context in which the chosen references (AF2005 and AF2015) are intermediated by the crisis 2008 financial year.

The conclusions indicate that for the equity-based incentives, beyond their incentivizing role for managers, options are an important variable that helps optimize the volume of incentives.

Regarding the advantages related to the risk of using bonuses and options, bonuses require additional inspection from shareholders to managers, have a reducing effect on shareholders' profit expectations and create pressure on managers, while options have the opposite effect, due to their alignment of the objectives of managers with those of shareholders. In addition, options encourage intrapreneurship and strategic planning by the manager

The empirical study confirmed, although not strongly, the validity of the models by numerically comparing their results with the real ones of one randomly chosen bank and finding a proximity in about 50% of the cases. The very low use of the incentives was also readable in the simulation, especially for the case of the options.

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CONTENTS

GLOSSARY

α	---	Share portion of the equity increase			
b	---	Base salary			
β	---	Options relative quantity			
c	---	Effort or innovation cost	p	---	Personal effort cost
C	---	Compensation			
d	---	Total amount of deposits			
e	---	Equity			
f	---	Depositors promised return	f_s	---	Safe depositors return
i	---	Investment			
k	---	Stock volume			
l	---	Losses			
L	---	Loan			
m	---	Managerial effort			
π	---	Deposit insurance	P	---	Insurance premium
π_m	---	Market value			
q	---	Risk parameter			
r	---	Premium rate	r_s	---	Safe premium rate
ρ	---	Minimum capital requirements rate			
s	---	Stock unit value			
sh	---	Shareholders' income			
t	---	Time period parameter			
tcf	---	Terminal cash flow	v	---	Value of the terminal cash flow
y	---	Income			
z	---	Return	z_i	---	Return of the investment
z_h	---	High return	z_l	---	Low return
H	---	Referring to "High"	L	---	Referring to "Low"

1. Introduction

This study addresses the payment of incentives to bank managers. It attempts to construct models that could generate analytical solutions to determine the costs of using alternative modes for the payment of incentives and to balance the volume of the use of each alternative. This is done in a context of ownership and management separation and from the perspective of performance and the risks that affect the managerial process.

The volume of the payment of incentives varies largely in accordance with the size and the type of the firm. This study is therefore restricted to the payment of incentives at banks, namely bonuses, stock and options, with the aim of identifying the best level of use and the benefits they bring to alleviate the agency problem in financial firms.

In this context, it is expected that the incentives have a direct relationship with the strategies that the manager uses as well as with his own entrepreneurial initiatives. As short-term incentives, the use of bonuses is expected to influence the choice of riskier strategies, while equity-based incentives, being long-term incentives, it is expected to be aligned with the most conservative strategies and with the objectives of shareholders.

Payment contracts for managers are normally designed based on the results of some studies, notably: (1) there is a positive and significant relationship between total manager pay and company performance measured by return on equity (ROE); and the payment policy for managers is a significant variable for understanding the leveraging level of the banks (Jucá *et al.*, 2012); (2) the pay-for-performance relationship of the bonus is very significant and positive for financial firms, which is potential evidence to support a correctly incentivized bonus scheme (Park, 2010); (3) Special emphasis was given to stocks and stock options as a determinant of payment programs for managers even before the systemic crisis from 2003 to 2006 (Jucá *et al.*, 2012); and (4) Stock options are almost always part of the optimal contract, since this typically has option-like features over the most probable range of outcomes (Armstrong *et al.*, 2007).

There have been many contributions in the literature on managerial pay based on item (1), notably from Armstrong *et al.* (2007), Park (2010), and Jucá *et al.*, (2012). Based on item (2), financial firms tend to place more emphasis on bonuses to reward better performance, benefiting from their high liquidity although suffering from high volatility. And item (3) refers to equity-based pay that involves two of the three chosen incentives for this study.

This study intends to further this discussion by adopting a new approach, namely, based on item (4). The study attempts to underline stock option payment as one of the best alternatives of incentives pay. Additionally, it seeks to establish the extent to which options could be used to maximize the manager performance without harmful consequences for the firm. Finally, options emerge as an essential variable in optimization problems due to the trade-off between the increase in managerial pay through the increase in shareholders' wealth and their dilution effect over the stock value.

Payment packages involved in employment contracts generally consist of a fixed salary and a list of incentives, of which stock, options and bonuses are the most prominent. Among these, executive stock options have become an increasingly important and controversial component of managerial pay. In this study, options play the primary role as they are compared to stocks in chapter 3 and to bonuses in chapter 4. The study is structured as follows:

Chapter 2 is devoted to a literature review. Stock and options are addressed in chapter 3 through a comparative study that strives to find the right balance between them, based on the models of John, Saunders and Subnet (2000) – (JSS model) and Stoughton and Wong (2003). The study introduces some improvements to the JSS model by including other forms of investment to ensure the financial stability with the offsetting effect of a portfolio of diversified services. Table 3.1 summarizes these improvements and the contributions to the literature. Chapter 4 analyses the relationship between risk and bank managers' pay by introducing options into the Cerasi and Oliviero (2015) model instead of bonuses, thereby reducing the need to inspect the manager, but obtaining the same or better effect. This is the chapter's main contribution to the literature and is summarized in Table 4.1. Chapter 5 complements this study by empirically analyzing managerial pay in a sample of 46 banks from a population of the world's 100 largest banks in early 2017, based on their reports from FY2005 and FY2015. As these years were intermediated by the 2008 financial crisis, the study also analyzes its impact on the possible measures and policies applied by the managers, in order to minimize the harmful effects of the crisis, including the level of use of incentives. Hence, the payment of managers from the sampled banks, the variation in their assets and equity, and other relevant information are analyzed and associated to the incentive pay. This is done for FY2005 and FY2015 with a view to identifying which changes took place in manager payment packages and their effect.

The general conclusions in relation to their effect on performance suggest that options play an important incentivizing role. Options also help to estimate the optimum volume of incentive. Concerning the risk related advantages of using bonuses and options, options prove to be less costly than bonuses. The results of the empirical study indicate that, for FY2015 particularly, the banks reduced their use of incentives, notably options, and opted in favor of cash payment, undoubtedly as a way to mitigate the effects of the 2008 financial crisis. The actual results therefore do not fully validate the results of the models in chapters 3 and 4.

The following chapter provides the literature review as well as the questions and hypotheses guiding the study.

2. Literature on incentives and bank strategies

One of the main problems in socio-economic ventures is that of the conflict between managers' own interests and the company's objectives which can make them less reliable. This problem, better known as the principal-agent problem, must be addressed whenever there is a need to hire skilled staffs and an attempt must be made to harmonize adverse goals.

When ownership and management are separated, the Board of Directors is the most common representative for the ownership of these corporations. The board is responsible for developing business strategy, approving an acceptable risk profile and retaining management commensurate with the size, complexity, business plan and risk profile of the institution. It must ensure that there are sufficient financial and internal controls to protect against any risk or hazard that would impair the operations and conditions of the institution (Handorf, 2015). However, the Board of Directors may also expand the chain of the agency problem by exercising its duties, and it usually has an incentive to favor the managers.

If the board delegates the choice of strategy to the managers, payment regulation is sufficient to stimulate intra-entrepreneurship and prevent overinvestment in strategies that increase risk, but it is less effective in preventing underinvestment in strategies that reduce risk (Kolm, *et al.*, 2015). Payment regulation increases shareholders' incentive to have an active board. Therefore, the agency problem solution is hardly ideal as it requires some monitoring measures by the respective principals. Thus, this agency chain – "depositors-shareholders-board of directors-manager" – aggravates the agency problem. However, for the sake of simplification, this study will consider the situations in which the direct relationship between shareholders and managers plays the most active role.

Much research has focused on how managerial pay schemes can help alleviate the agency problem in publicly traded companies (Bebchuk and Fried, 2003). In this vein, Eisdorfer *et al.* (2012) made a noteworthy contribution on the relationship between the absolute difference between the managerial pay leverage ratio and the firm leverage ratio, explaining the extent to which this relationship influences the distortion of the investment. In addition, studies by Banker *et al*. (2013) found that salary is normally adjusted to meet the reservation utility and information rent and is positively correlated over time to reflect ability, while the bonus serves to address

moral hazard and adverse selection by separating high ability agents into riskier contracts. This requires shareholders to come up with an efficient payment scheme by adequately mixing behavior and outcome-based contracts. Thus, managerial pay is seen as a mechanism for reducing agency problems as it is expected to bring managers' and shareholders' interests closer together.

Although much has been written and discussed on the agency problem, further study is still required due to the dynamics of the business environment to which it is subjected. Indeed, the issue of managerial pay has still not found consensus among experts in human resources, corporate governance and academics, as referred by Murphy (1998), Bebchuk and Fried (2003), John and Qian (2003), and Wang and Singh (2014). There is always room for more contributions to this problem through new updates.

Payment packages involved in employment contracts generally consist of a fixed salary and a list of incentives, of which stock, options and bonuses are the most prominent. Stock is the main variable of the equity-based pay. In fact, equity-based pay for the manager is one of the most widely used schemes to alleviate the agency problem in publicly traded companies because it positively influences the corporatism and stimulates the manager's intrapreneurship. Equity-based pay includes any payment to an employee, director, or independent contractor that is based on the value of specified stock (Jucá *et al.*, 2012). Although the relationship between firm performance, as measured by ROE and the equity-based pay has been demonstrated, there are some reservations about this type of payment when it deals with options, especially after the financial scandals attributed to the exercise of options (Collin *et al.*, 2014).

In relation to the bonus, studies by Park (2010) found that the bonus has a very significant and positive pay-for-performance relationship, which is potential evidence to support a correctly incentivized bonus scheme; in other words, this should be the most common type of incentive in banking.

However, stock options have become an increasingly important although controversial component of managerial pay. Options emerge as an essential variable in optimization problems because of the trade-off of the goals of raising the equity and the dilution effect of the options. Options link a manager's pay to stock performance because they positively influence the corporatism, stimulate the manager's intrapreneurship and because the value of a call option reflects the stock price. Although option usage has generally declined in recent years, notably

since the financial scandals attributed to the exercise of options, it remains substantial. The options are undeniably useful; not only do they confer compensatory advantages on investments, but they also help manage operational risks. Notwithstanding, options can influence the manager's behavior in a dual, but reversed, manner. On one hand, they encourage managers to undertake overly risky investments; on the other hand, they align the manager's risk-aversion and interests with those of the owners (Ju *et al.*, 2014). In other words, it is expected that options stimulate the manager's intra-entrepreneurship and his strategic planning, thus benefiting the firm. In this sense, in a general environment without restrictions on preferences or technologies, option-based contracts can work at least as well as direct stock-based contracts (Choe and Yin, 2006).

By assuming that stock options can indeed mitigate agency problems as ample studies suggest, the scholars presume that stock options affect corporate payout policy in one of two ways: (i) Better incentive alignment can increase the total payout level to resolve the free cash-flow problem and attain a better leverage ratio (Berger *et al.*, 1997); and (ii) Stock options change the composition of the payout, specifically, companies will favor repurchases over dividends (Muurling and Lehnert, 2004).

When the stock price drops below the option's exercise price and the option value declines, leaving the option ''underwater'', employees may leave. To prevent this, companies re-price options by lowering their exercise price. Re-pricing enhances employee retention in the presence of underwater options. In fact, payment consultants have estimated that the costs of turnover, including termination costs, lost productivity and costs of hiring and training a replacement, are about 150% of an employee's annual salary (Carter and Lynch, 2004). In addition, research provides evidence that re-pricing stock options follows poor firm performance.

Thus, structuring manager incentives to maximize shareholders' value in a levered firm tends to encourage excessive risk taking. The value of the stock is therefore like the value of a call option and increases the volatility (riskiness) of the assets held by the firm. So, while it may be in shareholders' interests to encourage a manager to take less risk to lower the cost of debt, if the manager's actions are unobservable, he/she might undertake excessive risk due to risk shifting (Bolton *et al.*, 2010). The inspection of managers' actions therefore comes in response to these constraints.

On this issue, risk management is influenced by the payment package due to the decision-making role exercised by managers. In this sense, empirically, stock will be more prevalent in incentive plans used by firms in which the manager's actions have a limited effect on the firm's operating risk, whereas options will be more prevalent if the manager's actions significantly affect that risk (Felthan and Wu, 2001). However, one argument against this is that managers hardly ever have to bear the downside risk potentially associated with stock options and that stock options pay is not very transparent to shareholders (Benz *et al.*, 2001). Thus, this case calls for further contributions.

When examining managerial pay, it is standard to either exclude the financial industry or look at it separately due to the unique difference in asset types and industry characteristics. The banking industry has its own complexity, including the following:

(i) The survival of organizations that results largely from the separation of "ownership" and "control", that is, in which important decision makers do not hold a substantial share of the wealth effects of their decisions. This separation of decision and risk-bearing functions observed in large corporations, and common to other organizations such as large professional partnerships, financial mutuals, and nonprofits, survives in these organizations in part because of the benefits of specialization of management and risk bearing but also because of an effective common approach to controlling the agency problems caused by the separation of decision and risk-bearing functions (Fama and Jensen, 1983);

(ii) The need for stability vis-à-vis the effect of product market competition on the payment packages for managers and, in particular, its impact on the sensitivity of pay to performance (Guadalupe and Cuñat, 2004), and the quality of the firm's investment decisions influenced by the similarity between managerial pay leverage and firm leverage (Eisdorfer *et al.*, 2013).

(iii) The tension created by the dual demands of financial institutions to be value maximizing entities that also serve the public interest, thus, highlighting the importance of information in addressing the public's desire for banks to be safe yet innovative, which, in turn, delegates to regulators the possibility of choosing various approaches to increase market discipline and information production (Mehran and Molineaux, 2012);

(iv) The cost of employee turnover, which is about 150% of an employee's salary, explained by the location of the company and its payment package as the most common factors that influence the decision to remain with the company, and payment and lack of challenge and opportunity as the most common factors leading to the decision to leave the organization (Ramlall, 2003);

(v) The usefulness of standard determinants of non-financial institutions - size, profitability, growth opportunity, tangible assets and payment of dividends -, in explaining the leveraging level of banks (Jucá *et al.*, 2012); and

(vi) The similarity between the manager payment leverage ratio and the firm leverage ratio that affects the quality of the firm's investment decisions; this is based on the rationale that by setting the payment leverage equal to the firm leverage, shareholders ensure that the value of the payment package is totally dependent on the firm value. Thus, there is an incentive for the manager to only take projects that increase the value of the firm's total assets, and he/she is less likely to engage in under- or overinvestment activities (Eisdorfer *et al.*, 2013).

In all these respects, the search for a solution involves a mutually beneficial contractual relationship with the manager, whose engagement is inevitably subject to the agency problem. Managerial pay schemes can help alleviate this problem (Bebchuk and Fried, 2003). Indeed, as shown by Benmelech *et al.* (2010), in a dynamic rational expectations model with asymmetric information, stock-based pay induces managers not only to exert costly effort, but also to conceal bad news about future growth options and to choose suboptimal investment policies to support their claim.

Three studies provide a good description of this intricate question of risk, namely, (1) on the connection between risk taking and managerial pay in financial institutions; an empirical analysis suggests that debt-like pay for managers is believed by the market to reduce risk for financial institutions (Bolton *et al.*, 2010); (2) on the relationship between managers' monetary incentives, financial regulation, and risk in banks; greater sensitivity of managers' equity portfolios to stock prices and volatility is associated with poorer performance and greater risk at the banks where shareholder control is weaker and in countries with explicit deposit insurance (Cerasi and Oliviero, 2015); and (3) on the effect of product market competition on the payment packages that firms offer to their managers and in particular its impact on the sensitivity of pay to

performance; a higher level of product market competition increases the performance pay sensitivity of managerial pay schemes (Guadalupe and Cuñat, 2004).

Concerning the banking sector and particularly its risk, the burden of these managerial problems is increased by the inherent risks of the manager's activities that hinder the achievement of objectives. This is due to decisions taken by the manager, and is often triggered by his/her incentive pay. It is common wisdom that managers of firms in the financial sector are awarded generous payment packages, and that these firms have a higher use of debt in their firm's capital structure (Barton and Laux, 2010). The extensive research on these issues includes studies by Bolton *et al.* (2010), Chan *et al.* (2013), Ju *et al.* (2014), Firestone and Wang (2014), Koehler (2015), and Cerasi and Oliviero (2015), to mention the most recent. John *et al.* (2000) propose a more direct mechanism of influencing bank risk-taking incentives instead of concentrating bank regulation on bank capital ratios, which may not be an efficient control of risk taking. This rationale aligns with arguments that the pay-performance sensitivity of top-management pay in banks might be a useful input in pricing the Federal Deposit Insurance Corporation (FDIC) insurance premium and designing bank regulation.

2.1. Main goal

This study addresses the payment of incentives to bank managers, namely bonuses, stock and options, with the aim of identifying the best level of use and the benefits they bring to alleviate the agency problem. Therefore, the study is guided by the main concern:

- How can different pay modes help alleviate the agency problem in banking?

However, and aligned with this driving concern, other specific worries that guide this research, are:

- Can options boost stock-level performance?
- Are stock options less risky than direct stock?
- Can options boost bonus-level performance?
- Are stock options less risky than bonuses?
- Did stock options play a major role in the 2008 financial crisis?

These questions have undoubtedly already been raised and discussed, mostly in the case of nonfinancial institutions. However, this study addresses these questions in the case of the banking

industry, in order to understand the potential effect of the three incentive types. The expected effects for chapters 3 and 4 can be hypothesized as follows:

Hypothesis 1: The Stoughton and Wong (2003) conclusion is also valid for the banking sector, i.e. stock options can work at least as well as direct stock in banks;

Hypothesis 2: Stock options can work at least as well as bonuses in banks.

Chapter 5 presents an empirical analysis of the world's 100 largest banks in early 2017 based on their reports for FY2005 and FY2015 with the aim of identifying the extent to which incentives were used in payment packages and their possible link with mitigating the effect of the 2008 financial crisis. To this end, the study uses correlation and regression analysis based on intrinsic hypotheses. However, in line with the suspicions that options may have been responsible for the financial crisis, the expected result can be hypothesized as follows:

Hypothesis 3: Stock options were the most used incentive tool by the banks.

The next three chapters test the validity of these hypotheses. Table 2.1 below summarizes the most relevant papers on managerial pay, incentives pay and risk in banking, within the set of references of this study.

Table 2.1: Summary of relevant references

Authors	Method	Dependent variables	Independent variables	Sample/Period	Main findings
Kose John, Anthony Saunders and Lemma W. Senbet (2000)	Conceptual, experiments	Value of terminal cash flow	Investment policy		FDIC[1] insurance premium scheme + Incentive features of top-management pay lead to more effective risk control.
Jean Dermine (2003)	Conceptual, experiments	Economic Profit,	Reserves CB[2], Loans, Bonds, Deposits, Equity, interest rates,		The usefulness of two models: the neoclassical model supported with the bank separation theorem, and the financial-based valuation model.
Neal M. Stoughton and Kit Pong Wong (2003)	Conceptual, experiments	Monopoly profit	Stock fractions, shock probability		Industry competition may play an important role in dictating which form of payment is optimal between stock and options.
Patrick Bolton, Hamid Mehran, and Joel Shapiro (2010)	Conceptual, experiments				Theoretically, excessive risk taking can be addressed by basing payment on both stock price and the price of debt. Debt-like pay for managers is believed by the market to reduce risk for financial institutions.
Michele Nascimento Jucá, Almir Ferreira de Sousa and Albert Fishlow (2012)	The dynamic regression model with panel data	Payment program for managers	profitability and growth opportunity	30 banks, with observations for the periods before and during the systemic crisis	The standard determinants of non-financial institutions – tangible assets, profitability, size, growth opportunity and payment of dividends, also have the power to explain the leveraging level of banks.

[1] Federal Deposit Insurance Corporation
[2] Closing balance

Gordon Wang and Parbudyal Singh (2014)	Conceptual and contingency-based framework				Significant evidence that employee payment in terms of systems, strategies, structure and problems varies with OLC[3] stages
Rutger Muurling & Thorsten Lehnert (2014)	Conceptual, experiments	Dilution, $EPS^4_{Diluted}$	Outstanding shares, options, earnings, share price, strike price.		The extraordinary combination of the loss of nonrecognition of stock options, the collapsing equity markets, the escalating accounting scandals and the accompanying negative aura of options will provide an extremely fertile ground for innovative and effective payment plans.
Simon Firestone & Ke Wang (2014)	probit	Survive, net charge-off	CAMELS[5], ROAA[6], provisions,	Financial data for U.S. BHCs[7] from SNL[8] Financial database.	Loan loss provisions for diversified banks are more informative about future net charge-offs than specialized banks; an increased focus on commercial real estate lending is associated to some degree with poorer forecast accuracy.
Vittoria Cerasi & Tommaso Oliviero (2015)	Conceptual, experiments	bank performance, terminal cash flow, income, payment	Buy&hold return, standard deviation of stock returns, loans, equity, deposits, bonus, investment policy.	Large banks around the world and their monetary incentives for managers in 2006	Greater sensitivity of managers' equity portfolios to stock prices and volatility is associated with poorer performance and greater risk at banks where shareholder control is weaker and in countries with explicit deposit insurance.

[3] Organizational Life Cycle
[4] Earnings per share
[5] **C**apital adequacy, **A**sset quality, **M**anagement, **E**arnings, **L**iquidity and bank's **S**ensitivity to market risk
[6] Return on average assets
[7] Bank Holding Company
[8] Security National Life Insurance Company

This thesis Chapter 3	Conceptual, experiments	Terminal cash flow, income, payment.	Investment policy, options volume.		Depending on the factors influencing the business environment, in some cases pure stock proves to be better than options, while in other cases the options are more advantageous. However, stock options can do at least as well as direct stock in banks.
Chapter 4	Conceptual, experiments	Terminal cash flow, income, payment.	Loans, equity, deposits, bonus, options volume, investment policy.		Bonuses are inefficient and more costly when compared to options. Therefore, stock options can do at least as well as bonuses in banks.
Chapter 5	Correlation and Linear Regression Models	Payment, strength, total cash, performance.	Total cash, shares, options, assets, equity, income, base salary, loans, bonus, deferred, investment.	The world's 100 largest banks in early 2017	The financial crisis of 2007-09 forced the financial system to take containment measures such as restrictions on investments, loans, and in most cases, payment packages for managers, especially incentives pay, with a view to cushioning the crisis effect. Models not fully validated due to the very low use of incentives.

This table summarizes the most relevant references supporting this study. Source: Author

3. Equity, options and bank strategies

3.1. Introduction

This chapter makes a comparative study of stock and options based on the models of John, Saunders and Subnet (2000) – (JSS model) and Stoughton and Wong (2003) in an attempt to weigh up these two forms of equity-based pay.

Equity-based pay is a particularly debated aspect of managerial pay. Equity-based pay includes any payment to an employee, director, or independent contractor that is based on the value of specified stock (Jucá *et al.*, 2012). The relationship between firm performance, as measured by ROE, and equity-based pay has been demonstrated although some reservations remain about this type of payment when it deals with options, notably since the financial scandals attributed to the exercise of options (Collin *et al.*, 2014).

In this setting, executive stock options have become an increasingly important and controversial component of managerial pay. The incentives provided by executive stock options are at the center of the ongoing debate surrounding the crisis in corporate governance and spectacular failures, such as Enron, WorldCom, and Global Crossing (Ju *et al.*, 2014). Options link a manager's pay to stock performance because the value of a call option is a function of the stock price. More recently, option usage has generally declined but it is still substantial. However, options have a dual, but reversed, effect on the manager’s behavior.

Since the value of call options is becoming more volatile, it has been argued that options encourage managers to undertake overly risky investments and therefore affect the managers’ willingness to make risky investments. By assuming that stock options can indeed mitigate agency problems as ample studies suggest, the scholars understand that stock options affect corporate payout policy in one way: better incentive alignment can increase the total payout level to resolve the free cash-flow problem and attain a better leverage ratio (Berger *et al.*, 1997). Nevertheless, in a general environment with no restrictions on preferences or technologies, option-based contracts can function at least as well as direct stock-based contracts (Choe and Yin, 2006). It is undeniable that stock options challenge the manager’s strategic planning and intra-entrepreneurship abilities.

This chapter addresses these human resource factors and their close link with the performance of the firm, based on agency theory. The conclusion confirms hypothesis 1 and the

study also introduces some improvements to the JSS model by including other forms of investment to ensure the financial stability with the offsetting effect of a portfolio of diversified services. Table 3.1 summarizes these improvements and the contributions to the literature.

The remainder of this chapter is organized as follows: the next section presents the model; section 3 addresses managerial pay; and section 4 discusses the comparative advantages of using stock and options. This is followed by the conclusion and appendix.

3.2. The Model

Following the JSS model scheme, begin with a representative depository institution under moral hazard and incomplete contracting. The institution is run by a manager hired by shareholders under an incentive package designed to align the manager's objectives with those of shareholders. Consider a two period, three-date model: $t = 0, 1, 2$. At $t = 0$, the institution collects deposits and engages in residual financing through equity subject to existing regulatory constraints. The manager chooses both debt issuance and the underlying riskiness of the bank's investments.

Next consider a classical incentive contract, where the manager receives a fixed salary and a payment that depends on the price of the bank's stock. In this context, the manager may refer to a small team of managers. Deposits are insured by a government agency (the FDIC), the minimum capital requirements are in place, and the bank pays the relevant insurance premium, P. All associated contracts are written and priced at $t = 0$, given the available information and admissible contracting opportunities.

At an interim date, $t = 1$, investment opportunities appear. These opportunities represent the possible loans (asset choices) that the bank can make. The manager chooses both debt issuance and the underlying riskiness of the bank's investments. The insiders observe the risk parameter q before they choose between the riskless loan and the risky loans, but the outsiders (depositors and regulators) do not. However, all the relevant parties know that q is distributed uniformly over the interval [0, 1].

For simplicity, assume that these investment opportunities are of two types: safe investments which are loan opportunities (to which the bank has monopoly access) with zero risk and nonnegative NPV, with the safe investment policy [1] for which the gain is also null, but with an assured recovery of the investment, i.e., the certain outcome, z_i, is guaranteed. This is

consistent to the extent that, by convention, the probability of absolute certainty is 1. The other type consists of the choice from a menu of possible risky investments (loans) which are indexed by a parameter q ($0 \leq q < 1$). The returns from the risky loan-backed projects are high or low (z_h or z_l, respectively), with $z_h > z_i > z_l > 0$, where q is the probability of the certain outcome, z_i, and $(1 - q)$ the probability of the uncertain outcomes, z_h and z_l. (See Diagram 3.1)

At $t = 2$, loans mature and the proceeds are collected. Let *tcf* denote this terminal cash flow, which is equal to z_i if the riskless investment was chosen at $t = 1$ or equal to z_h or z_l, depending on the outcome from the risky investment if that choice was made at $t = 1$. The firm pays the depositors *min* (*f*, *tcf*) and the deposit insurance agency (FDIC) honors its guarantee by paying the depositors *max* (0, *f-tcf*). Depositors are thus paid off fully if their deposits are fully insured for failure.

Assuming that all deposits are insured, the investment schedule of this model is as follows:

a) At $t = 0$, incumbent equity holders hire a manager under a linear incentive contract $C = C(b, \alpha)$, where b ($b > 0$) is base salary, and α ($0 \leq \alpha < 1$) is the share of the equity increase.

b) At $t = 1$, investment opportunities appear. The manager chooses the bank's risk q after observing the parameter q. The bank raises investment funds, i, from depositors and/or bondholders to fund the asset, with a promised return of $(1+r)i$.

c) At $t = 2$ the returns, *tcf*, on the asset are realized. Depositors and bondholders are paid first. If there are returns left over, the equity holders get the residual value.

For the majority of the analysis, exogenously fix i and assume that the bank already has sufficient funds at stage (b). Depositors are insured and minimum capital requirements are in place. Unlike the JSS model, and following the Basel III for vital banking parameters (capital, leverage, funding and liquidity), ignore short-term incentive packages like bonuses because in this chapter the study is concerned only with long term packages.

3.2.1. Investment characteristics

The bank raises funds through deposits and subordinated debt, and for a total amount d of deposits and subordinated debt, it promises a return of $f = (1+r)d$, where r is the premium rate. Assume that all lenders to the bank have an outside option of investing their money in an

alternative that yields a safe return of $f_s = (1+r_s)d$, with $r_s < r$. For simplicity, assume that all agents are risk-neutral and set the discount rate to zero.

Firestone and Wang´s (2014) results suggest that an organization's diversification has a stronger positive impact on risk management. This could be explained by the benefits of diversification in that diversified risks are easier to predict as a whole since errors in the forecasting of individual product losses are not perfectly correlated. Diversification in loans may also be an indicator of sound risk management practice; hence, portfolio diversification and smaller loss forecasting errors are simultaneously determined by good risk controls.

In line with this rationale, the banks usually have portfolios with several applications; however, for simplicity consider a bank portfolio with two applications only; that is, the bank has two mechanisms through which it can apply its investment, which are explained as follows:

1. The bank applies one part of investment, i_1, in safe investments that yield a safe return $tcf_1 = (1+r_s)i_1$ at $t = 2$.
2. The bank applies another part of investment, i_2, in bold investments according to an observed risk parameter q, that is, the bank has access to an investment technology with the following characteristics: by investing an amount i_2, the bank can obtain a gross return tcf_2, where tcf_2 can have three possible values:
   - A certain return, z_i, with the probability q;
   - A high return, z_h, with the probability $(1 – q^2)/2$; and
   - A low return, z_l, with the probability $(1 – q)^2/2$.

   This means that when the bold investment is risky, it can certainly recover i_2 with the probability q, and additionally produce the risky return with the probability $(1 – q)$. This probability is split into z_h and z_l with the probabilities $(1 – q^2)/2$ and $(1 – q)^2/2$, respectively.

In this schema, the return of i is then the sum of the results from the safe investment i_1 and the bold investment i_2. If the bold investment produces the certain outcome with the investment policy [1], this will reflect no activity, meaning that no investment technology was set up and no risk was run (See Diagram 3.2).

The return on the asset, tcf_1, is fixed, in that the safe premium rate, r_s, is fixed. Concerning the effect of the parameter q for i_2, a decrease in $q \in [0,1[$ thus reduces the probability of recovering i_2, while also increasing the riskiness and the returns z_h and z_l , thus creating a Risk-Return Trade-off (See Table 3.4 and graph 3.1).

3.2.2. Best outcome

Since $(1+ r_s)i_1$ is obtained through safe alternatives, assume this result to be guaranteed and consider it as fixed.

Thus, concentrate on the second mechanism of engaging the investment, the result of which depends on decisions to be made by the manager about the risk level q. In this sense, this feature establishes a forecasting relationship of the possible outcomes z_i, z_h, and z_l, and each result is linked with a probability to recover the investment. The value of the terminal cash flow resulting from an investment policy [q], denoted $v(q)$, is $tcf_2 = z_i$ if $q = 1$, otherwise, and based on JSS model Lemma 1 about the optimal investment policy, v can be easily specified as:

$$v(q) = tcf_2 = qz_i + \frac{1}{2}(1-q)^2 z_l + \frac{1}{2}(1-q^2)z_h, \qquad (1)$$

for which the optimal investment policy is

$$\hat{q} = \frac{z_i - z_l}{z_h - z_l} \qquad (2)$$

And the corresponding best (optimal) return is

$$v(\hat{q}) = tcf_2^* = \frac{z_h{}^2 + z_i{}^2 - 2z_i z_l}{2(z_h - z_l)}. \qquad (3)$$

With these equations, when q is varied from 1 to 0, the value of the terminal cash flow increases from i_2 to $v(\hat{q})$ and then decreases towards $\frac{z_h + z_l}{2}$. $v(\hat{q})$ is the highest value achievable in a full information scenario with complete contracting. Moreover, it is easy to see that the values of the curve $v(q)$ are normally centralized, with $\hat{q} = 0.5$, if $i_2 = \frac{z_h + z_l}{2}$; declining, with $\hat{q} > 0.5$, if $i_2 > \frac{z_h + z_l}{2}$, and increasing with $\hat{q} < 0.5$, if $i_2 < \frac{z_h + z_l}{2}$.

The return on the asset, tcf_1, is assumed to be guaranteed, and when added to tcf_2, all together make the total returns *tcf*.

Concerning the leverage, in some cases the level of equity capitalization and the corresponding level of deposit claims of promised payment *f* may be high. When this is the case and *f* is high enough, it induces risk-shifting, which incentivizes managers to implement an investment policy riskier than $\hat{q}$, with lower value, $v(q) < v(\hat{q})$, and according to the JSS model Proposition 1, as follows:

$$q(f) = \begin{cases} \hat{q}, & (z_l \geq f) \\ \dfrac{z_i - f}{z_h - f}, & (z_l < f < z_i) \\ 0, & (f \geq z_i) \end{cases} \qquad (4)$$

This is due to the fact that it is inversely related with the bank's equity, that is, high levels of *f* parameterize corresponding low capital-asset ratios.

Considering the incentive effects of a bank's financial structure on its investment incentives, the JSS model has shown the conditions under which the managers are more or fully aligned with the equity holders or with depositors to influence the choice of the most adequate investment policy [q^m]. However, since this study is only concerned with the long-term incentive packages, the [q^m] of the JSS model becomes $q(f)$, and this aligns the manager's interests with those of the equity holders only by replacing *q* with $q(f)$ in equation 1 to produce $v(q^m)$.

The minimal investment policy that is suitable with this equation is precisely the optimal one. Other lower investment policies are riskier and produce lower incomes that can fall to 0, if $z_l \geq f$.

3.3. Managerial pay

The linear incentive payment contract, $C = C(b, \alpha)$, is applied as follows. The manager receives a fixed salary $b > 0$, and a fraction α of the equity increase of the bank. Therefore, the total reward for shareholders is the increase in equity, calculated as $\max\{0, y\}$, with $y = tcf - i$. The fraction α for the manager affects this equity increase. Thus, one obtains $C = b + \alpha y$.

For convenience, assume that the fixed salary component is paid out of the bank's operating cash flow such that the terminal cash flow $tcf = \{z_i, z_h, z_l\}$ is residual to the fixed payments, b, to the manager. With this feature the incentive pay can easily be calculated as follows:

$$\Delta C_\alpha = \alpha y. \tag{5}$$

Since the stock fraction α turns the manager into shareholder, ΔC_α is subject to all rules that regulate equity. From equation (5), it follows that the total payment to the equity holders is obtained from the increase in equity through the equation:

$$\Delta e = (1 - \alpha)\, y. \tag{6}$$

Thus, the linearity of the α-based payment of incentive fixes no critical point for the parameterα, which means that the manager could benefit from almost all dividends if α is set badly, say $\alpha \approx 1$. On the other hand, this lack of reference results in shareholders being free to choose when they randomly define incentive parameters to design payment contracts. Thus, the model does not provide a pareto-optimal reference, relegating the parameter setting to the discretion of the shareholders. Some other variables are required to help set an optimum reference that can assist in the design of the manager incentive payment contracts objectively. The options appear as one of these variables.

3.4. Option-based Pay

Stoughton and Wong (2003) have developed a model (See Diagram 3.3) in which they considered the two alternative equity-based pay systems for the professional staff, namely stock-based and option-based pay. Their model showed that option-based pay and stock-based pay are equivalent, at least in a monopolist market, except when $p_1\pi_m(c_2) > qp_2\pi_m(c_1)$, where π_m is the market value, c_1 and c_2 represent the costs associated with innovation, and p_1 and p_2 are the personal costs before and after a shock, respectively. In this case the use of option-based pay strictly dominates the use of stock-based pay. This relationship, $p_1\pi_m(c_2) > qp_2\pi_m(c_1)$, holds when the effort cost p_1 of the first period is larger when compared to the second period effort cost p_2, if the probability of the shock, q, is small, or even if there is relatively little difference between the profits in the respective states, i.e., $\pi_m(c_1) - \pi_m(c_2) \approx 0$.

However, options still continue to fuel debate among researchers such as Dittmann *et al.* (2006), who argue against them, thus opening up the possibility for a deeper discussion on the subject. Moreover, in a competitive environment, options can create risks that stock does not have. As Collin et al. (2014) stated, options are not so much an incentive instrument, aligning the manager's interest with the absent owners' interest, but more a recruitment and retention instrument and an indication of manager strength. When managers can be swayed by competitors, options can serve as a strategy to retain managers, especially at the start-up stage of a firm's organizational life cycle. Since options have an additional contract parameter compared to that of stock, they can often provide the same incentives at a lower cost (Stoughton and Wong, 2003).

This discussion could be infinite in that many other factors influence the advantages of options over the straight stock, while some other factors have the opposite influence. One of the factors in favor of options is the development stage in the company's organizational life cycle. As stated by Milkovich and Rabin (1991), cited by Wang and Singh (2014: 149), "firms at the start-up stage of organizational life cycle development tend to pay their managers lower cash and larger stock options than those at the maturity stage". Moreover, "growing firms grant more stock options to their managers than do stagnant firms, while the manager pay-performance sensitivity for growing firms is higher than for stagnant firms". Thus, every organization is located within a particular configuration of contingencies derived from its own context, hence influencing the payment strategy to be chosen.

In this tangle of arguments, this study does not strive to determine who is right, but rather to contribute to the search for the critical point at which it is indifferent whether stock-based or option-based incentive pay is used.

Consider the option-based pay.[9] At $t = 0$, instead of a fraction α of stock, the bank grants the staff a portion β ($\beta \in [0;1[$) of call options on firm value with an exercise price, x. Although setting the variables q and β depends on the expectations about the investment to be made, these variables are not correlated because they occur at different and sequential moments and use different criteria. The former is observable and its use is induced by the investment opportunities that appear, while the latter is fixed based on the expectations for the equity increase.

[9] For a survey on the use of option-based pay see Muurling and Lehnert (2004).

Since stock produces a linear payment proportional to the volume of granted stock, for the comparison of the optimum of stock-based versus option-based pay, consider first that *n* options corresponding to β were granted to the manager as an incentive and the options exercise price, *x*, is related with the stock unit value *s*, as $x = \rho s$, where $(0 < \rho \leq 1)$ is a constant. Thus, one has $k = \frac{e}{s} = \frac{\rho e}{x}$, where *k* is the stock volume and *e* the equity, before hiring the manager.

As incentive pay represents an additional reward for an increase in the equity, the manager receives:

$$\Delta C_{\beta} = \frac{ny}{k+n} \ , \tag{7}$$

where $y = tcf - i$, after the deduction of all taxes, and $\frac{y}{k+n}$ represents the additional stock unit value in the case of $y > 0$. The income, *y*, may be lowered if other incentives, such as bonuses, are used, if the discount rate for the risk aversion is set up, or Basel restrictions are applied. Nevertheless, if $\frac{y}{k+n} \leq x$ the options are underwater and $\Delta C_{\beta} = 0$.

Due to the decreasing effect of the options in the stock unit value – the dilution effect –, the benefit for the manager will initially increase with the number of options, attain a maximum at a specific level, and then decrease towards 0 (See graph 3.2).

Since ΔC_{β} depends on the income *y*, and *y* depends on *n*, from Equation (7) it is immediately visible that the optimum ΔC_{β}^{*} can be expressed through the following equations:

$$\Delta C_{\beta}^{*} = y + \frac{k\,x}{\rho} - 2\sqrt{\frac{y\,k\,x}{\rho}} \ , \tag{8}$$

Or

$$\Delta C_{\beta}^{*} = \frac{n^2 x}{\rho\, k} \tag{9}$$

Which occur, respectively, when

$$n^* = \sqrt{\frac{y\rho k}{x}} - k \text{, for } y > kx = \rho e, \quad (10)$$

or

$$y^* = \frac{x \cdot (k+n)^2}{\rho k} \text{, when instead of } y, n \text{ is known.} \quad (11)$$

This means that the manager can always set the expected optimum income y^*, when the n granted options are known, whenever n is set randomly, and the shareholders can estimate the optimum options number n^*, when the expected optimum income y^* is known.

This optimum represents the level at which the manager is fully aligned with the owners. Thus, when the manager fails to reach the optimum expectations, he/she also comes to harm. This result is a goal that the manager should pursue so as not to run the risk of failing to optimize his/her own incentives. However, it is easy to see that if n value is too high, y may become unfeasible, and if $n = 0$, there is no increase in the equity volume, which makes the incentive useless even in the case of high stock appreciation. In this last situation, there is no exercising of options and, consequently, this will bring no changes in shareholders' dividends.

Conclusion

This study makes an analysis based on the JSS (2000) and the Stoughton and Wong (2003) models, in search of an optimum reference for the incentive pay for banks' managers, which aligns the interests of managers with those of owners.

The results show that, on one hand, the linearity of the α effect on the payment contract does not allow an optimum limit to be set for the stock parameter, α, in its interval [0,1[, which means that the manager could benefit from almost all the income (if $\alpha \approx 1$); on the other hand, this absence of reference gives shareholders the freedom to randomly set incentive parameters when designing payment contracts, although this increases the level of subjectivity.

Thus, as this can be done to favor shareholders and possibly also managers, this parameter does not help provide a solution to the problem of the optimality of the stock-based incentive pay. Other variables are required to help set an optimum reference for the objective design of the managerial pay contracts. This brings us to options.

Interestingly, this does not seem to impress the banking industry as options are not frequently used even though they appear to be the necessary variable for optimizing incentive payments. This suggests that the sector either has other mechanisms to optimize the payment of incentives, or that the shareholders are not very interested in an optimal payment contract for the manager that would certainly be more costly. Another reason may be the dilution effect of the options that delays the valuation of the shares and, certainly, is not in the shareholders' interest. One more reason may be the nature of the long-term incentive of options that do not fit the short-term management that liquidity (deposits) imposes.

In an attempt to answer some of the questions posed in the hypotheses section regarding the comparison between pure stock and stock options, the model results show that pure stock can prove better than options in some cases, but options are more advantageous in others depending on the factors influencing the business environment. However, in addition to the advantages identified in the literature, options provide a reference, $y* = \frac{x \cdot (k+n)^2}{\rho k}$, that allows managers to set their goals, when the number of granted options, n, is known or the parameter β, and allows the shareholders to set n optimally based on the expectations z_h, as $n^* = \sqrt{\frac{y^* \rho k}{x}} - k$. These two equations hold only for $y > kx = e$.

Thus, unlike pure stock, options allow an optimal level to be set that can then be used to estimate the best level for the parameter α through its relationship to β. This is an important feature that pure stock alone does not have.

Thus, this confirms Hypothesis 1: "The Stoughton and Wong (2003) conclusion is valid for the banking sector, i.e. stock options can do at least as well as direct stock in banks".

Appendices

Table 3.1: Contributions of the model with respect to the JSS model

JSS (2000) model	Contribution of this model
1. Bank regulation concentrated in capital ratios is potentially inefficient in controlling risk taking. 2. **New approach** (a more direct mechanism of influencing bank risk-taking incentives)**:** FDIC insurance premium scheme and Incentive features of top-management pay lead to an effective Risk control.	1. Incentive features of top-management pay may be done **in two different pay modes (stock based and option-based pay)**, without discarding the FDIC insurance premium scheme, to obtain the same effective Risk control. 2. **Options** are a valid and useful reference variable for the banks. 3. The portfolio of **diversified investment forms** provides a more effective Risk control.

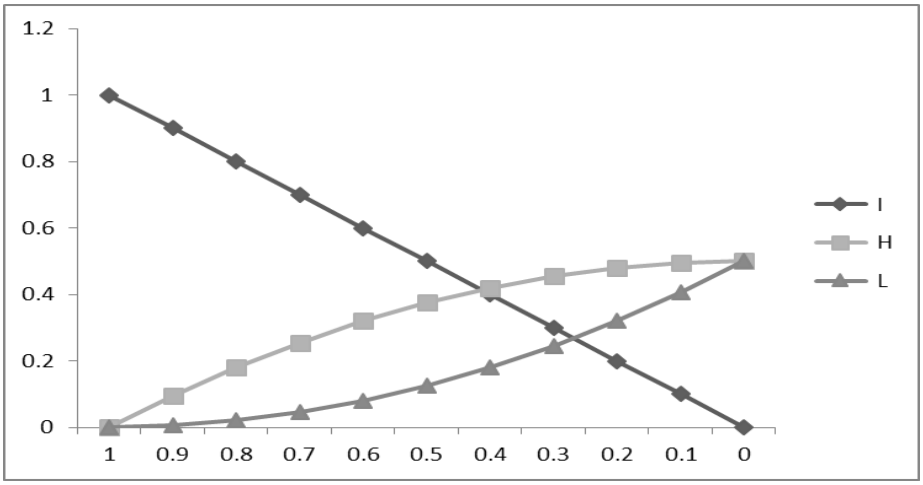
Source: Author

Table 3.2: Variation of the probabilities for the returns *I*, *H* and *L*

	q	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
I	q	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
H	$0{,}5(1-q^2)$	0	0.095	0.18	0.255	0.32	0.375	0.42	0.455	0.48	0.495	0.5
L	$0{,}5(1-q)^2$	0	0.005	0.02	0.045	0.08	0.125	0.18	0.245	0.32	0.405	0.5

This table and the respective graph below show the behavior of the probabilities for the normal (*I*), high (*H*) and low (*L*) expectations, when *q* varies from 1 to 0, according to the JSS model Lemma 1.

Graph 3.1: John, Saunders and Senbet model



This graph depicts the probabilities distribution for normal (*I*), high (*H*) and low (*L*) expectations, when *q* varies from 1 to 0, according to the JSS model Lemma 1.

Application Example

This example uses simulated data in a very simplified context. Observing all rules about the minimum requirements, suppose that at $t = 1$ a bank applies a half investment of i_1 = \$500,000 (liabilities: d = \$500,000) in a safe investment with a safe return rate of 10%. Further, it applies another half, i_2 = \$500,000 (equity: E = \$200,000 + liabilities: d = \$300,000), in a bold investment. The proportion of the investment in each type may differ according to firm or investment specificities. In this example, the investment share could be different, but this case adopts an equity share of 20% of the investment to adjust to banks' propensity for high liquidity.

The safe investment i_1 should produce the revenue tcf_1 = 1.1 * 500,000.00 = 550,000.00, with the income y_1 = \$50,000.00.

Concerning the bold investment and to set the highest benchmark, suppose that the market is characterized by an increasing rate of 0.4. In normal conditions, this last investment will produce the income z_h = 1.4*500,000 = \$700,000 at $t = 2$, that should be considered as the highest. Because of the shareholders' risk neutrality, which sets the discount rate to zero, in this case one has $f = d$ = \$300,000.

The bold investment needs a tempting incentive $\alpha > 0$. So let $\alpha = 0.1$. Then consider three cases: (a) $z_l \geq f$, (b) $z_l < f < z_i$ and (c) $f \geq z_i$.

The first expectations about the results are shown in Table 3.2. The respective investment policies can be deduced as follows:

(a) Panel 1 shows the case $z_l \geq f$: Suppose that the expected income is higher than d, say 350,000. Under these conditions, the investment policies can be calculated as follows:

$$q^m = \hat{q} = \frac{z_i - z_l}{z_h - z_l} = \frac{500{,}000 - 350{,}000}{700{,}000 - 350{,}000} \approx 0.43 \text{; with}$$

$$tcf_2^* \approx 0.43 \times 500{,}000 + 0.5 \times 350{,}000 \times (1 - 0.43)^2 + 0.5 \times 700{,}000 \times [1 - (0.43)^2] = 557{,}142.86.$$

Table 3.2

Investment	Safe	Risky	
Outcome	z_i	z_h	z_l
Panel 1	\$500,000	\$700,000	\$350,000
Panel 2	\$500,000	\$700,000	\$250,000
Panel 3	\$500,000	\$700.000	\$600,000

Given that $z_l = 350{,}000 \geq f = 300{,}000$, from equation (4) it follows that the manager's result, $y_2^* = 57{,}142.86$, will be in accordance with all shareholders' expectations.

(b) Panel 2 shows the case $z_l < f < z_i$: Suppose that the expected income falls below d, say to \$250,000. Under these conditions, the investment policies can be calculated as follows:

$$q^* = (z_i - z_l)/(z_h - z_l) = (500{,}000 - 250{,}000)/(700{,}000 - 250{,}000) \approx 0.56, \text{ and}$$

$$q^m = (z_i - z_f)/(z_h - z_f) = (500{,}000 - 250{,}000)/(700{,}000 - 250{,}000) = 0.5; \text{ with}$$

$$tcf_2^* \approx 0.56\times500{,}000 + 0.5\times250{,}000\times(1- 0.56)^2 + 0.5\times700{,}000\times[1- (0.56)^2] = 544{,}444.44; \text{ and}$$

$$tcf_2^m \approx 0.5\times500{,}000 + 0.5\times250{,}000\times(1- 0.5)^2 + 0.5\times700{,}000\times[1- (0.5)^2)] = 543{,}750.00.$$

Given that $z_l = 250{,}000 < f = 300{,}000 < z_i = 500{,}000$, from equation (4) it follows that the manager will choose this last investment policy that produces the income $y_2^m = 43{,}750.00$ which is a little below optimal, $y_2^* = 54{,}444.44$.

(c) Panel 3 shows the case $f \geq z_i$: Now suppose that d is higher than the projected investment z_i, say \$600,000. Under these conditions and from equation (4), the investment policy is the riskiest: 0. The expected terminal cash flow with this investment policy is

$$tcf_2^m = 0.5 \times (700{,}000 + 600{,}000) = 650{,}000, \text{ with } y_2^m = 150{,}000.$$

However, this is a very rare and, thus, unrealistic situation. Listing the results backwards, the global terminal cash flow for this last case gives: $gtcf_3 = tcf_1 + tcf_2 = 550{,}000 + 650{,}000 = 1{,}200{,}000$. The second case result is $gtcf_2 = 1{,}093{,}750$ and the first case result is $gtcf_1 = 1{,}107{,}142.86$.

Assuming that s was diluted in the operating cash flow α will focus on the chosen incomes to produce the results summarized and shown in Table 3.3 below.

Table 3.3

	Chosen q	Profit (a)	Equity Increase (b = a + 50,000)	Incentive Payment (α = 0.1b)	Profit After Dividends (sh = 0.9b)
$L < F < Z_i$	0.5	43,750.00	93,750.00	**9,375.00**	84,375.00
$F \leq L$	0.43	57,142.86	107,142.86	**10,714.29**	96,428.57
$Z_i \leq F$	0	150,000.00	200,000.00	**20,000.00**	180,000.00

In this table, (b) is the addition of profit (a) with 50,000 from the safe investment

These results permit the simulation of the corresponding simplified balance sheet and income statement according to Jean Dermine (2003), as follows in Table 3.4, in which the model was relaxed by considering all taxes and dividends as nonexistent. In this case, consider the lowest profit resulting from the chosen investment policies.

Table 3.4

BALANCE SHEET

Assets	***Liabilities and Equity***
T_1 = *500,000*	*Liability = 800,000*
T_2 = *500,000*	*Equity = 200,000*
Total Assets = 1,000,000	***Total = 1,000,000***

INCOME STATEMENT

Profit (I_1)	*50,000.00*
Profit (I_2)	*43,750.00*
Total Profit	***93,750,00***
Variable Costs	9,375.00
Gross Profit	***84,375.00***
Fixed Costs	*0*
Profit before tax	***84,375.00***
Income tax	*0*
Net income	***84,375.00***
Dividends	*0*
Profit after Dividends	***84,375.00***

Turning to option-based incentives, and under the same assumptions on the minimum requirements and market characteristics, to set the highest benchmark, suppose again that at $t = 1$ a bank applies i_1 = \$500,000 (liabilities: d = \$500,000) in a safe investment with a safe return rate of 10%. Further, it applies i_2 = \$500,000 (equity: E = \$200,000 + liabilities: d = \$300,000) in a bold investment.

Considering the first frame, the exercise price, x = 100, allows the shareholders or their representatives to set their income expectations level at $y = 0.1 \times 500{,}000 + 0.4 \times 500{,}000 = 250{,}000$. For the given exercise price, one has k = 2,000 and this allows the granting of

$n = \sqrt{\frac{yk}{x}} - k = \frac{1}{10}\sqrt{250{,}000 \times 2{,}000} - 2000 \approx 236$ stock options for $\rho = 1$, aligning the manager's interests with those of the shareholders.

With this result, in this case, it is expected that the equity will rise 250,000, i.e. from 200,000 to 450,000, the options exercise will raise the stock volume from 2000 to 2236, and the stock unit price from 100 to $y/(k + n)$ =250,000/(2000+236) ≈ 111.80, giving the manager a yield of 236×11.80 ≈ 2,785 by exercising his/her options. This provides a share of about 26,385 from 250,000, corresponding to $\alpha = \beta \approx 0.11$ of the additional stock volume and about 0.06 of the new (total) stock volume.

These results permit the simulation of the corresponding simplified balance sheet and income statement according to Jean Dermine (2003), as follows in Table 3.5, in which the model was relaxed by considering all taxes and dividends as nonexistent.

Table 3.5

BALANCE SHEET

Assets	***Liabilities and Equity***
T_1 = 500,000	*Liability = 800,000*
T_2 = 500,000	*Equity = 200,000*
Total Assets = 1,000,000	***Total = 1,000,000***

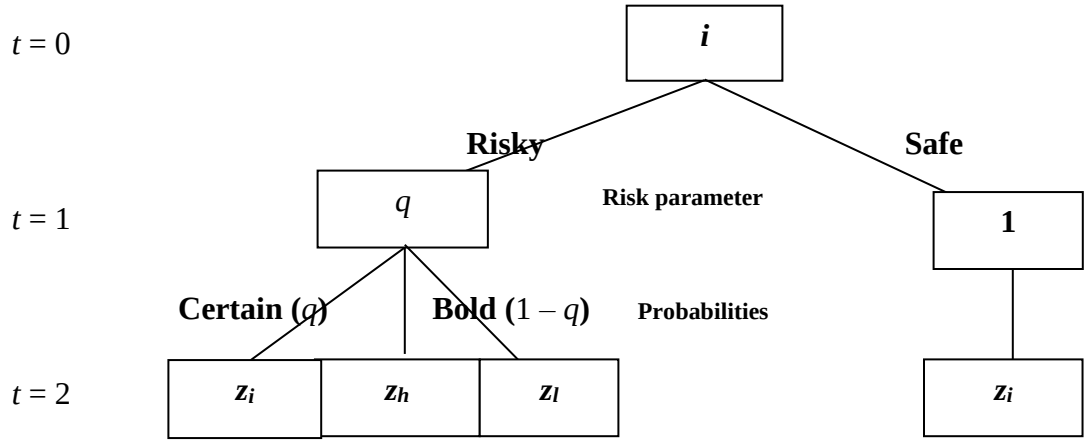
INCOME STATEMENT

Profit (I_1)	*50,000.00*
Profit (I_2)	*57,142.86*
Total Profit	***107,142.86***
Variable Costs	*26,384.80*
Gross Profit	***80,758.06***
Fixed Costs	*0*
Profit before tax	***80,758.06***
Income tax	*0*
Net income	***80,758.06***
Dividends	*0*
Profit after Dividends	***80,758.06***

In this case, both pure stock-based and stock option-based incentives produce the same results if they are equally valued. However, the benefit of the options is that α level must be randomly set while the β level can be calculated. Thus, the relation $\alpha = \varphi(\beta) = \mu\beta$, where μ is a constant, should help manage the α variation and set its level optimally.

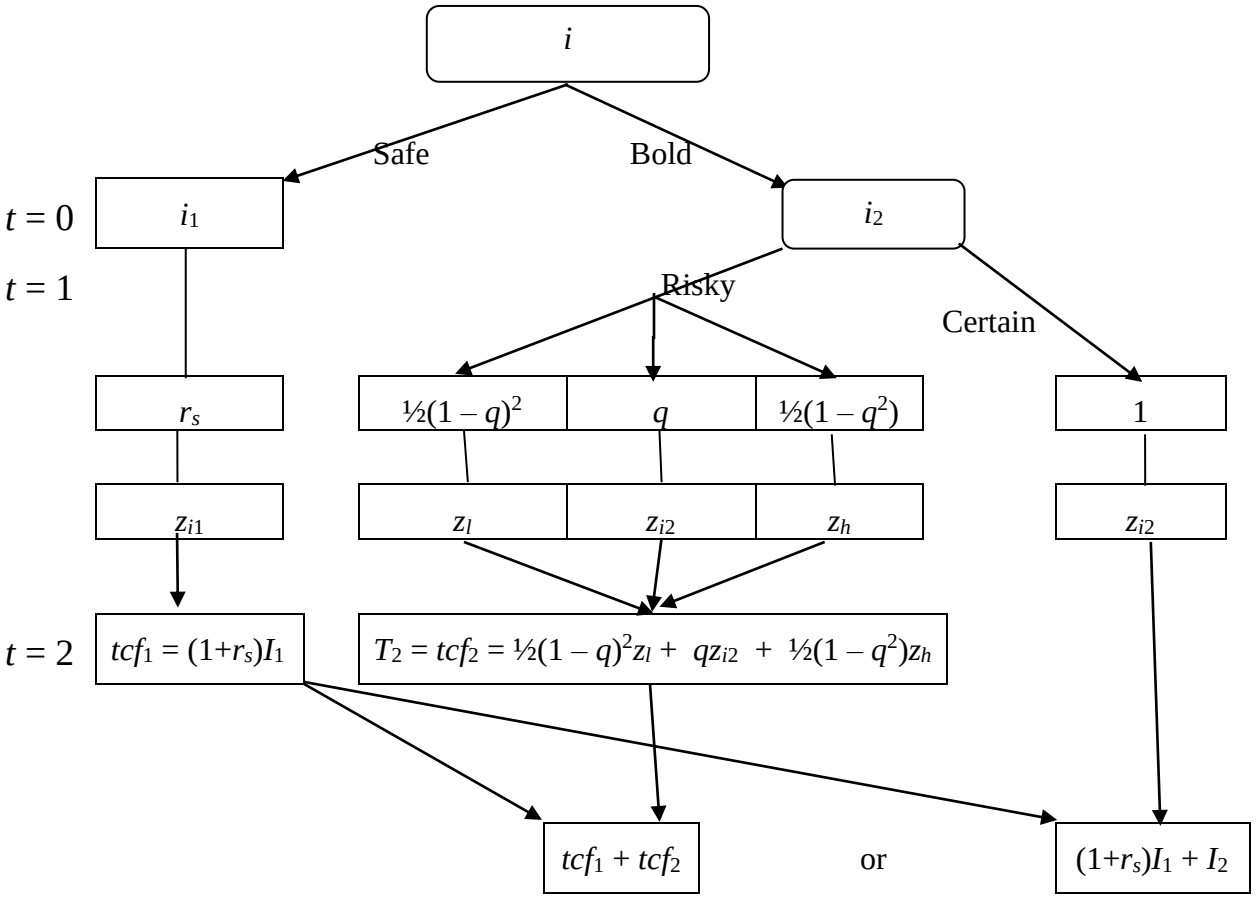
Diagrams

Diagram 3.1: The decision moments



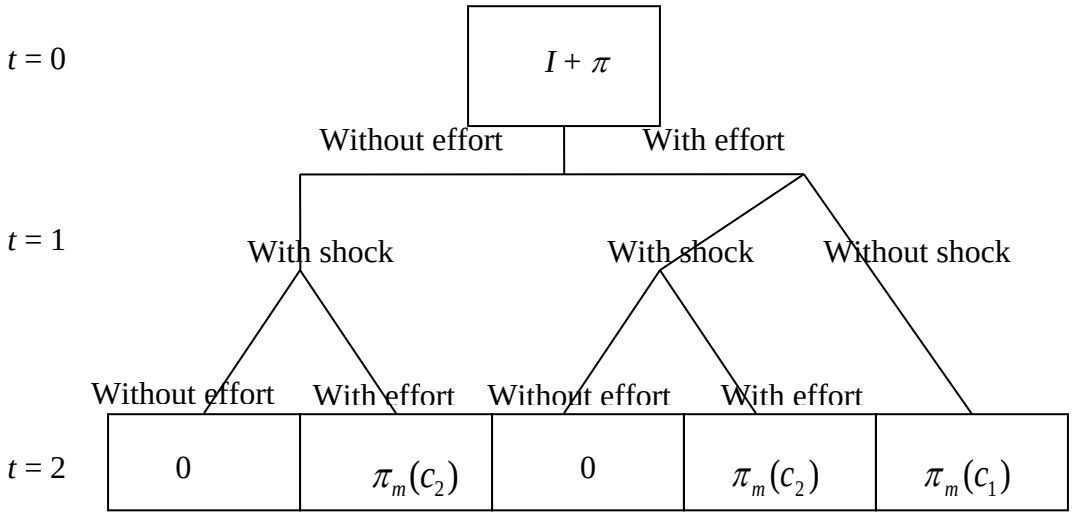
This diagram represents the decision moments of the JSS (2000) model and the expected respective outcomes

Diagram 3.2: The investment schedule



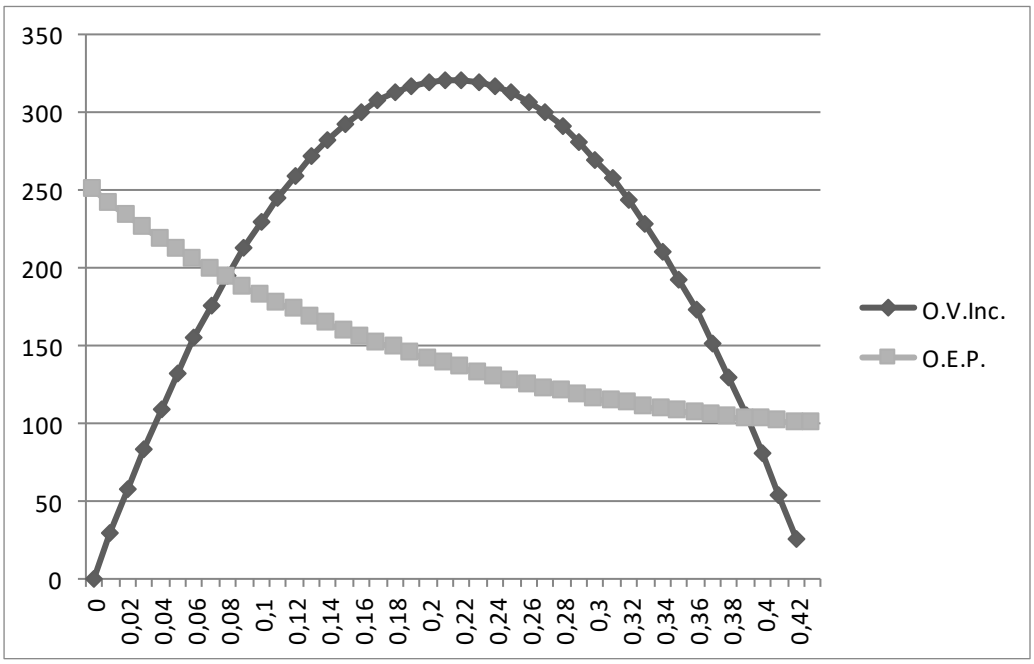
In this schema, the manager has two decision moments: (1) at t = 0 he (she) chooses at least two investment alternatives: a safe and a bold investment and decides how much to apply in each alternative, depending on the amount of funds being collected. (2) For the bold investment, at $t = 1$, he (she) decides whether to apply in a risky opportunity or just to keep the money safe in a secure investment. For the risky opportunity, he (she) has two expectations: certainty and risky. Source: Author

Diagram 3.3: The Neal M. Stoughton and Kit Pong Wong model



This diagram was extracted from Stoughton and Wong (2003) model and represents the evolution of the information and distribution of terminal cash flow.

Graph 3.2: Options dilution **E**ffect on the **S**tock **U**nit **P**rice vs. **O**ptions **V**olume for the **Inc**entive



This graph depicts the options' dilution effect on the stock unit price. The increase in the amount of options results in a lowering of the stock unit price, but its effect on the incentive volume is convex, with a maximum (optimal) reference according to equation (9). Source: Author

4. Bonuses, options and bank strategies

4. 1. Introduction

This chapter analyses the relationship between risk and bank managers' pay, by replacing bonuses with options in the model of Cerasi and Oliviero (2015), and comparing the weight of the influence of each of these incentives on bank risks.

In modern corporations, it is common to separate ownership and management. Where this is the case, the Board of Directors is the most common representative for the ownership of the corporations. The Board of Directors is responsible for developing business strategy, approving an acceptable risk profile and retaining management commensurate with the size, complexity, business plan and risk profile of the institution. In this setting, payment regulation increases the shareholders' incentive to set up an active board.

However, the Board of Directors may appear to expand the chain of agency by exercising its duties, and there is usually an incentive to favor the manager. If the board delegates the choice of strategy to the manager, payment regulation is sufficient to avoid both types of risk shifting, i.e. overinvestment in risk-enhancing strategies and underinvestment in strategies that reduce risk (Kolm, et. al., 2015). Therefore, the solution to the agency problem is hardly the ideal and requires some monitoring measures by the respective principals.

Managerial pay tied to firm performance in its various forms, such as bonuses related to firm value, stock options, and equity plans, has become a standard instrument of managerial pay in all sectors, and especially in banking. Indeed, much research has focused on how managerial pay schemes can help alleviate the agency problem in publicly traded companies (Bebchuk and Fried, 2003). Despite the extensive debate and works on this subject, further understanding of the agency problem is required due to the business environment to which it is subjected. In fact, there is still no consensus among experts in human resources, corporate governance and academics on the issue of managers' pay, as referred by Murphy (1998), Bebchuk and Fried (2003), John and Qian (2003), and Wang and Singh (2014). Thus, there is always room for more contributions with updated results to bring them in line with this dynamic.

In this chapter, the study contributes to the literature on loans that need to be monitored by managers. If the manager's incentive is options-based, it can provide the same or a better effect than that provided by the bonuses. Table 4.1 summarizes this improvement.

As noted previously, the following findings are helpful when designing payment contracts for managers, and they will guide this study to some extent: (1) there is a positive and significant relationship between total manager pay and company performance measured by return on equity (ROE), and the payment policy for managers is a significant variable for understanding the banks' level of leverage (Jucá *et al.*, 2012);[10] (2) the bonus has a very significant and positive pay-for-performance relationship in financial firms, which is potential evidence to support a correctly incentivized bonus scheme (Park, 2010).[11]; (3) Payment programs for managers based on stocks and stock options assumed great importance even before the systemic crisis from 2003 to 2006 (Jucá *et al.*, 2012);[12] and (4) Stock options are almost always part of the optimal contract; the optimal contract typically has option-like features over the most probable range of business outcomes (Armstrong *et al.*, 2007).

The second finding above generally results in financial firms placing more emphasis on bonuses to reward better performance, as they benefit from high liquidity despite suffering from high volatility. This benefit is the main feature of the financial industry that allows it to use bonuses. In fact, when examining managerial pay, it is standard to either exclude the financial industry or look at it separately due to the unique differences in asset types and industry characteristics. Thus, unlike the Cerasi and Oliviero (2015) model, this study contributes to this discussion by taking a new approach in which an alternative incentive pay is suggested based on the use of stock options. This aligns with the fourth finding above. The suggested incentive pay establishes the extent to which stock options could be used to maximize the manager's performance without harmful consequences to the firm.

Thus, section 2 addresses microeconomic modeling, section 3 the equilibrium bank risk and stock options; and section 4 compares the effects of bonuses and options; this is followed by the conclusion confirming hypothesis 2, and appendices.

4.2. The Model

This study builds upon the Cerasi and Oliviero (2015) model and uses stock options instead of bonuses to assess how they change the model.

[10] For more details on this issue see Barton and Laux (2010), Kevin J. Sigler (2011), Bhagat and Bolton (2011).
[11] Banks have significantly more leverage than other types of firms and this is an important distinguishing feature. In addition to conventional agency problems, these highly leveraged institutions are susceptible to risk-shifting agency problems.
[12] For more details on this finding see Doucaliagos et al. (2007), Barton and Laux (2010), Bhagat and Bolton (2011).

Begin by considering a bank holding a portfolio of size L of risky loans with perfectly correlated returns. Each loan returns $z_i > 1$, so that $\Sigma z_i = z > 1$, although loan losses, l, occur with probability q. Thus, the portfolio returns $(z - l)L$ with probability q, and zL otherwise. The returns are fully observable by third parties. The bank collects funds from wealthy and varied investors whose alternative return on their capital is 1. Assume that all agents are risk neutral.

At date $t = 0$, bank shareholders, owning capital e, collect deposits d and extend loans L. Depositors are fully insured. Hence, each unit of deposit bears zero risk premium. Given the presence of the deposit insurance, the income of the loan portfolio is divided as follows: when the portfolio is successful, it returns zL, and what remains after depositors are repaid the promised amount d goes to bank shareholders. When loan losses are realized and the portfolio returns $(z - l) < d$, all the income goes to the deposit insurance fund that repays depositors d, leaving bank shareholders without any income.

Assume that the deposit insurance premium is fully funded through taxpayers' money and that bank shareholders do not recognize it. The amount of insured deposits that the bank will be able to collect is given by the bank's balance sheet at time $t = 0$, i.e.

$$L = e + d. \qquad (1)$$

In what follows, assume that there is a capital ratio ρ imposed by the regulator requiring a minimum of capital for each unit of loans, so that $L \leq e/\rho$. Loans can be directly monitored by exerting an effort $m \in [0,1]$ at a private cost $0.5c^2$, with $c \geq 0$, to reduce the probability of losses from q_H to q_L, with $0 \leq q_L < q_H < 1$. Assume that $z - q_H l < 1 < z - q_L l - \frac{c}{2}$.

This implies that only monitored loans are worth financing. When loans are monitored, they have a positive NPV; hence, the size of the bank is limited by its minimum capital ratio. Assume that shareholders delegate the task of monitoring loans to a bank manager. Monitoring cannot be observed but has the (private) cost $0.5c^2$. Despite this, the bank manager cannot shirk this duty because his/her incentive package is reflected in the shareholders' earnings.

In the case of bonuses, shareholders can inspect the activity of the bank manager with intensity $s \in [0,1]$ at a specific (private) cost. As a result of this scrutiny, shareholders could decide to fire the manager and replace him/her with another manager. However, the alignment

provided by the options will force the manager to exert an independent monitoring effort in order to raise the value of stocks to a level at which (s)he can exercise the options favorably, before the date of their expiration. Thus, the shareholders' inspection effort is offset by the effect of the option-based incentive package.

The internal effort of the activity of monitoring the loan portfolio cannot be observed by outsiders of the bank but is privately costly for the party in charge of it, causing a moral hazard problem. However, the impact of monitoring the loans affects the probability of losses q. The specific value of this probability must be derived from the optimum choice of effort of the bank manager.

Summarize the timing of events on three dates, t = (0, 1, and 2) as follows:

- At $t = 0$, bank shareholders with capital e collect insured deposits d and lend L (limited by a capital ratio $L \leq e/\rho$) and they hire a manager to monitor loans.
- At $t = 1$, the bank manager must exert a monitoring effort with intensity m to reduce expected loan losses, aligning his/her interests with those of shareholders. Due to the nature of the incentive pay, shareholders do not need to inspect the manager.
- At $t = 2$, the loans return a revenue, and the income is shared among the parties.

At date $t = 0$, the managerial pay is disclosed to all third parties. Depositors are insured and minimum capital requirements are in place. Effort choices are not observable, while returns from projects are observable to outsiders. This timing of events implies that outsiders can observe the managerial pay but cannot infer the insiders' actual effort level choices. The model is solved in reverse: equilibrium efforts and returns are computed for a given managerial payment.

4.3. Equilibrium bank risk and stock options

Unlike Cerasi and Oliviero (2015), this section uses stock options. The bank manager, whose choice of effort responds to monetary incentives, is offered monetary pay, namely the sum of a fixed salary, b, and β stock call options on the rising equity resulting from successful portfolios. For convenience, assume that the fixed salary component is paid out in the bank's operating cash flow such that the terminal cash flow $tcf = \{z_i, z_h, z_l\}$ is residual to the fixed payment, b, to the manager. This means that the fixed salary is set equal to zero for the sake of simplicity. Hence, the bank manager is granted $\beta \in]0,1[$ stock options with an exercise price x.

Since options are equity based and part of a long-term incentive package, they produce post-exercise effects within the exercise period only. However, the bank manager knows that (s)he needs to exert a monitoring effort in order to make the portfolio successful, so that it can be beneficial to him/her, and that effort produces results normally evaluable at t_2. Thus, there is an alignment of shareholders' and manager's interests. This fact relaxes the need for internal supervision by shareholders and guarantees that the manager is not fired, unless (s)he has no ambition to grow his/her own earnings. This goes against human nature so can be ignored as can the doubt about the manager's abilities, i.e., the moral hazard is much reduced.

The stock options represent the variable component of the managerial pay and, given that it is tied to a good performance of the loan portfolio, it can be interpreted as a "pay-for-performance" scheme. The shareholders use the average level of income to measure the performance, in line with their expectations. Thus, shareholders will not fire the incumbent manager unless the portfolio losses are visible and (s)he fails to reach that average level of expected income. In this case, the new bank manager is offered the same incentive package and shareholders will benefit from firing the incumbent bank manager only in the next investment cycle.

As a result of this exemption from inspection by shareholders, the inspection related parameters s and ϕ from equation (2) from the Cerasi and Oliviero (2015) model are set to null. This has a simplification effect of the next equation 2 that solves for the monitoring effort as a fixed point of the best reply functions.

$$q(m) = mq_L + (1 - m)\, q_H = q_L + (1 - m)\Delta = q_H - m\Delta, \qquad (2)$$

where $\Delta \equiv q_H - q_L$. The probability of losses is q_L when the bank manager exerts effort.

4.3.1. Bank Managerial Pay

Given the bank shareholders' limited liability, in the event that the loan portfolio falls short due to losses, the deposit insurance repays insured depositors the entire face value d. Hence, the expected profit of the bank can be deduced as follows:

$$tcf = [1 - q(m)](zL - d), \text{ with } q(m) \in [q_L\,,\, q_H], \qquad (3)$$

Where the probability $q(m)$ is defined in (2). This produces the following income

$$y_0 = tcf - e = [1 - q(m)](zL - d) - e. \quad (4)$$

Because of the minimum capital requirements, the income to be shared can be expressed as

$$y_1 = (1 - \rho)\{[1 - q(m)](zL - d) - e\}. \quad (5)$$

Hence, for a given managerial incentive pay β, the expected utility of the incumbent bank manager can be expressed by

$$y_m = \beta(1-\rho)\{[1-q(m)](zL-d)-e\}-\frac{c}{2}m^2L, \quad (6)$$

While the shareholders income is

$$sh = (1-\beta)(1-\rho)\{[1-q(m)](zL-d)-e\}+\frac{c}{2}m^2L. \quad (7)$$

The relationship of the probabilities for equations (4), (5) and (7) can be seen in figure 4.1.

Because of the linearity of equation (3), $q(m)$ only has a decreasing effect in y_0 y_1, and sh. In turn, m has a decreasing effect in $q(m)$ and, hence, an increasing effect in the variables y_0 y_1, and sh. Concerning y_m, through the first derivative of equation (6), the best reply function of the bank manager utility in terms of monitoring, m, is the solution to $\frac{dy_m}{dm} = \beta\Delta(1-\rho)(zL-d) - cmL = 0$, i.e.

$$m = \frac{\beta\Delta(1-\rho)(zL-d)}{cL}. \quad (8)$$

If c, Δ, ρ, z, d and L are known, the m variation in its interval makes it possible to establish the corresponding interval for and a relationship with β that helps extract the best corresponding volume of options as

$$\beta = \frac{cmL}{\Delta(1-\rho)(zL-d)}. \quad (9)$$

Equation (8) indicates that the monitoring effort m of the bank manager increases with β granted stock options, and equation (9) indicates that the granted stock options β increase with the monitoring effort m of the bank manager, in order to minimize losses. The suitable interval for both m and β is [0;1]. However, setting β without criteria i.e., if β values are too high, means

they can move *m* out of its suitable interval before reaching the optimum, thus reducing the effectiveness of the monitoring effort (see Table 4.2). β has a positive correlation with the monitoring effort *m* that makes it possible to set the highest suitable value for β. One example of this relationship can be seen in Table 4.3, as well as in the numerical example. An example of the behavior of the results *m*, y_0 y_1, y_m and *sh* can be seen in Table 4.4 and in Graphs 4.1 and 4.2, which were depicted based on the corresponding Tables 4.5.

From the manager's perspective, examples summarized in Tables 4.5 explain the behavior of the manager's incentive. However, β has an uncertain effect on the probability of loan losses *q*, in that the manager might take more risks. The graphs 4.1 and 4.2 illustrate how the increase in β values is beneficial for the manager when moving the best *m* from 0 to 1. They also illustrate how β values above 0.3 in the example make *m* values unsuitable within the interval [0;1], i.e. the best *m* value falls out of this interval. This unfeasibility can be better understood by looking at Graph 4.1 that depicts the manager's incentive, where β values higher than 0.3 move the optimum (maximum) *m* out of the interval [0;1]. In contrast, from the shareholders' perspective, the unfeasibility can be better understood by looking at Graph 4.2 that depicts the shareholders' income *sh*, where the higher the β values, the lower the income.

In addition, β also influences the interval [q_L, q_H], in that the larger β is, the larger the interval. While β only has a decreasing effect on the shareholders' income, for fixed and adequate values its dilution effect makes the benefit for the manager initially increase with the monitoring effect *m*, attain a maximum at a specific level, and then decrease. This decreasing interval for the incentive pay fades for values above the optimum β.

There is a critical point for *m*, in which all manager incentive graphs cross, as do shareholders' income graphs regardless of β values. For this critical *m* value, the incomes *y* are null, the manager's incentive is negative and the shareholders' income is positive and symmetrical to the manager's negative incentive value, because it accurately reflects the minimum monitoring effort so as to avoid losses. This critical *m* value is provided by the following equation

$$m = \frac{e - (1 - q_H)(zL - d)}{(q_H - q_L)(zL - d)}. \qquad (10)$$

Other causal relationships that can be read from equations (5) and (7) are that[13]:

(i) The probability of loan losses q decreases with a larger capital ratio ρ; and

(ii) In a bank with a larger capital ratio ρ, a larger incentive β is more effective in reducing the probability of loan losses q.

4.3.2. Risk-Sensitive Deposit Insurance

When the deposit insurance premium is charged to the bank at date $t = 0$, there is an additional countervailing effect due to the larger managerial incentive having an expected impact on the risk through the deposit insurance premium. Assuming that the bank shareholders pay a fair premium to the deposit insurance at date $t = 0$ to refund depositors for the expected shortfalls on the face value of their deposits, one has

$$\pi = q(m)\,[d - (z - l)L], \tag{11}$$

Hence, the bank's balance sheet at date $t = 0$ is given by

$$e + d = \pi + L. \tag{12}$$

Thus, an increase in managerial incentive can be even more beneficial. However, when larger β options have the effect of increasing the bank risk, a risk-sensitive deposit insurance premium might exacerbate the negative effect. In fact, a risk-sensitive premium reacts to the increase in risk by reducing the stake of revenues from loans retained by shareholders. Under these conditions, Equation (2) remains unchanged, but the following equations (4) – (9) are subject to small changes in accordance with π, by replacing L with $\pi + L$.

4.4. Bonuses and Options

A quick look at the results from equations (4) to (8) allows us to compare them with the results of the Cerasi and Oliviero (2015) model and draw the following conclusions.

- While bonuses create conflicts of interests between managers and shareholders and require shareholders to make an additional inspection of the managers' activities,

[13] The relationships (i) and (ii) were proved in the Cerasi and Oliviero (2015) model. The relationship (ii) is equally valid using stock options, although the proof in the Cerasi and Oliviero (2015) model was obtained using bonuses.

options establish an alignment of interests between the parties. In this case, because of the convergence of interests, shareholders do not need to inspect the manager's effort.[14]

- As a result of this exemption from inspection by shareholders, equation (2) from the Cerasi and Oliviero (2015) model is simplified to equation (2) in this model, giving $\Delta q(m) = -(1 - m)s\Delta\varphi < 0$; this means that, compared to options, bonuses have a lowering effect on the income expectations by reducing $q(m)$, and also lower the actual inspection cost, $-0.5Ms^2L_0 < 0$.
- As a result of the inspection by shareholders, bonuses have an immediate effect in that they are short-term incentive pay. In contrast, as long-term incentive pay, options cause a delayed effect because of their maturity period, thus granting stable conditions.
- However, in the case of the manager's poor performance, bonuses may have an advantage over the stock options because they allow immediate intervention in order to reverse the harmful effects of this performance.

[14] When this is the case, the criteria for firing the manager are also different. Whereas with bonuses the manager can be fired at any time, with stock options the manager is safe in that (s)he might be fired only after the loans' maturation because the moral hazard is minimized. So, instead of firing, the options can serve as a retention strategy for the manager, especially when managers can be swayed by competitors.

Conclusion

This study simulates the Cerasi and Oliviero (2015) model by replacing bonuses with options. The implications drawn from this exercise can be summarized as follows:

(1) Bonuses maintain the conflict of interests between the manager and shareholders which entails an additional inspection of the manager's activities by shareholders, while options establish an alignment of interests between the parties;

(2) Bonuses have the effect of lowering the shareholders' income expectations; this is not the case of options because their yield is only processed over a relatively long exercise period, when loans are matured;

(3) Due to the need for an inspection by shareholders in the case of bonuses, they create a pressure on the manager and threaten his(her) position with the firm; inversely, options create safe conditions for the manager to act in a relaxed, but responsible and independent manner because his/her interests and those of the shareholders are aligned;

(4) Bonuses only seem to have the advantage over options when the manager's performance is poor in that prompt corrective action can be taken to reverse the situation.

This exercise strengthens the position of those who defend the benefits of stock options, despite the fact that they have been severely criticized, notably since the recent financial crises. It showed that, at least for equity-based pay, options emerge as a strong and safe alternative for the payment of incentives, although they can encourage managers to run unnecessary risks.

The implications drawn above confirm the expectations about the influence of bonuses vis-à-vis options in the strategies that the manager uses as well as with his own entrepreneurial initiatives. Bonuses proved to influence the choice of riskier strategies, while options proved to align with the most conservative strategies and with the objectives of shareholders.

In an attempt to answer some of the questions posed in the hypotheses section regarding the comparison between bonuses and stock options, the model results show that options can outperform the bonus-level, since bonuses are more costly than options. However, for this issue, the cost of private monitoring can cushion the negative impact of taking unnecessary risks. Thus, Hypothesis 2 is confirmed: “Stock options can do at least as well as bonuses in banks”.

Appendices

A - Application Example

This example uses simulated data in a very simplified context. Suppose that at $t = 0$ a bank engages a loan L = \$1,000,000 (equity: e = \$200,000; liabilities: d = \$800,000) with a capital ratio ρ = 10%. Suppose that at $t = 1$ the manager exerts a monitoring effort m that must be at least $q_L = 0.2$ and at most $q_H = 0.8$. Where the optimal m is not defined, set the average $m = 0.5(q_L + q_H)$. Additionally, set $c = 0.1$, and $\beta = 0.2$. Because of the risk neutrality of shareholders that sets the discount rate to zero, in this case one has $f = d$ = \$800,000.

To estimate the revenue, assume that the market is characterized by an increasing rate of 0.4, which means that in normal conditions this loan will produce $z = 1.4 > 1$. This produces the income $z_h = 1.4*1{,}000{,}000$ = \$1,400,000 at $t = 2$. Within this frame one has:

- Probability of loan losses:

$$q(m) = mq_L + (1 - m)\, q_H = q_L + (1 - m)\Delta = q_H - m\Delta = 0.8 - 0.5(0.8 - 0.2) = 0.5;$$

- Terminal cash flow:

$$tcf = [1 - q(m)](zL - d) = 0.5 \times 600{,}000 = 300{,}000;$$

- Increasing equity:

$$y_0 = \Delta e = [1 - q(m)](zL - d) - e = 300{,}000 - 200{,}000 = 100{,}000;$$

- Deducting the minimum capital requirements:

$$y_1 = (1 - \rho)\{[1 - q(m)](zL - d) - e\} = 0.9 \times 100{,}000 = 90{,}000;$$

- Management incentive pay:

$$y_m = \beta(1 - \rho)\{[1 - q(m)](zL - d) - e\} - 0.5 \times cm^2L = 0.2 \times 90{,}000 - 12{,}500 = \underline{5{,}500};$$

- And shareholders' profit after dividends:

$$(1 - \beta)(1 - \rho)\{[1 - q(m)](zL - d) - e\} + 0.5 \times cm^2L = 0.8 \times 90{,}000 + 12{,}500 = 84{,}500.$$

But seeking the manager's optimum incentive pay for this volume of granted options, β = 0.2, and following the same procedure, his/her most suitable monitoring effort can be computed

as $m^* = \beta\Delta(1-\rho)(zL-d)/cL = 0.2\times0.6\times0.9\times600{,}000/(0.1\times1{,}000{,}000) = 0.648$, which produces the following results:

- Probability of loan losses:

$$q(m^*) = m^*q_L + (1-m^*)q_H = q_L + (1-m^*)\Delta = q_H - m^*\Delta = 0.8 - 0.648(0.8-0.2) \approx 0.4112.$$

- Terminal cash flow:

$$tcf = [1-q(m^*)](zL-d) = 0.5888 \times 600{,}000 = 353{,}280;$$

- Increasing equity:

$$y_0 = \Delta e = [1-q(m^*)](zL-d) - e = 353{,}280 - 200{,}000 = 153{,}280;$$

- Deducting the minimum capital requirements:

$$y_1 = (1-\rho)\{[1-q(m^*)](zL-d) - e\} = 0.9 \times 153{,}280 = 137{,}952$$

- The best management incentive pay:

$$y_m^* = \beta(1-\rho)\{[1-q(m^*)](zL-d) - e\} - 0.5cm^{*2}L = 0.2 \times 137{,}952 - 20{,}995.2 = \underline{\mathbf{6{,}595.2}};$$

- And the corresponding shareholders' profit after dividends:

$$sh = (1-\beta)(1-\rho)[1-q(m)](zL-d) + \frac{c}{2}m^2L = 0.8 \times 137{,}952 + 20{,}995.2 = 131{,}356.8.$$

Obviously, this last procedure is the most applicable, and will be the manager´s preference.

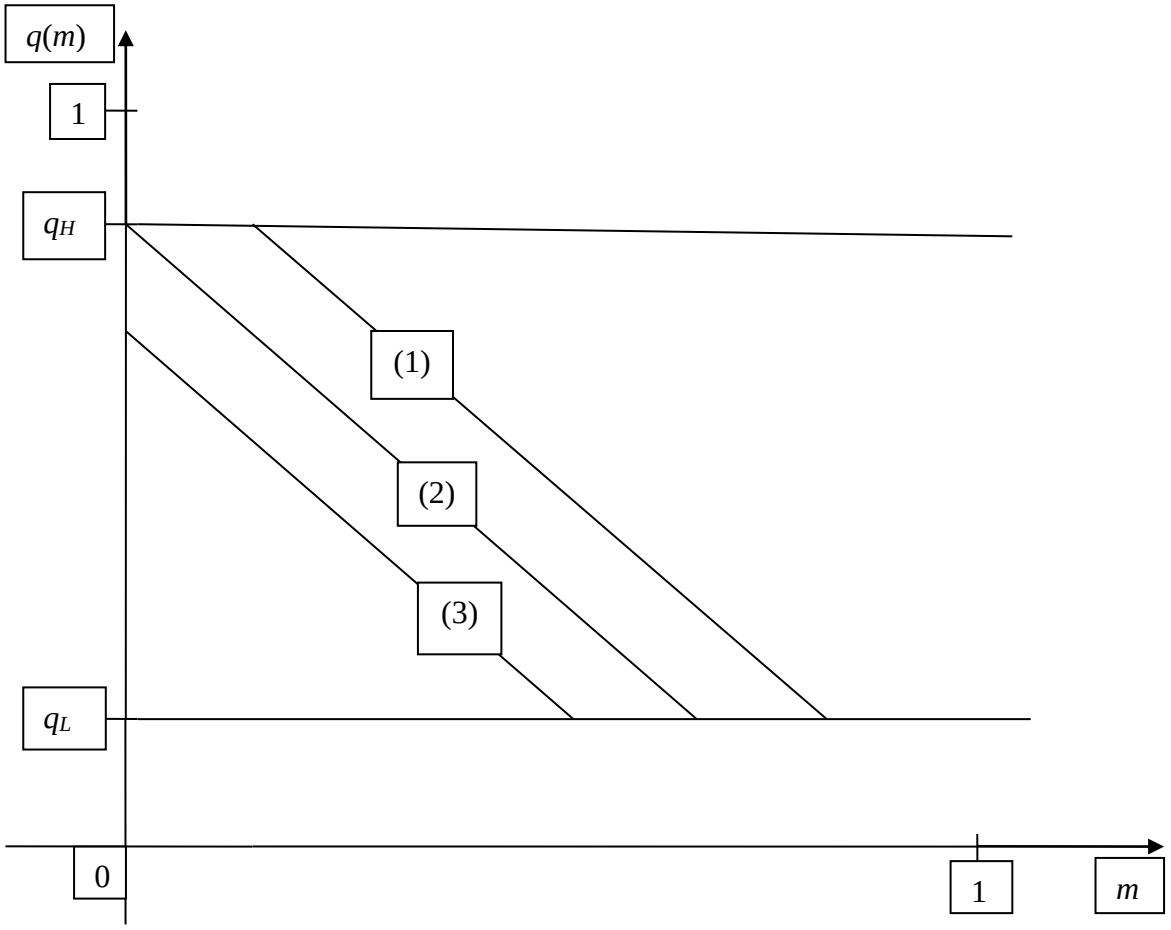
B - Figures, Tables and Graphs

Table 4.1: Contributions of the model with respect to the Cerasi and Oliviero model

Cerasi and Oliviero (2015) model	Contribution of this model
Incentive type: **bonus** + Monitoring effort + Inspection effort ⇓	Incentive type: **options** + Monitoring effort ⇓
Good result	Same or better result

This table shows the effectiveness of the options when compared to bonuses, as they save shareholders' inspection effort. Source: Author

Figure 4.1: The relationship of q and m.



This figure depicts top-down, the parallel probability lines (1) of the expected profit of bank, $1 - q(m)$; (2) of the income to be shared, with the minimum capital requirements in place, $(1 - \rho)[1 - q(m)]$; and (3) of the shareholders' income, $(1 - \beta)(1 - \rho)[1 - q(m)]$. Source: Author

Table 4.2: *m* as a variable explained by β (Eq. 7)

L	***d***	***e***	**Δ**	**ρ**	***c***	**β**	***m***
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0**	**0**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.1**	**0.324**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.2**	**0.648**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.3**	**0.972**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	*0.4*	*1.296*
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	*0.5*	*1.62*
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	*0.6*	*1.944*
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	*0.7*	*2.268*
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	*0.8*	*2.592*
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	*0.9*	*2.916*
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	*1*	*3.24*

This table simulates the monitoring effort *m* limits according to the granted options portion β, under certain conditions (known values for ***L***, ***d***, ***e***, **Δ**, **ρ** and ***c***). In this example the monitoring effort, *m*, requires that the options portion, β, is not much higher than 0.3. Source: Author

Table 4.3: β as a variable explained by *m* (Eq. 8)

L	***d***	***e***	**Δ**	**ρ**	***c***	***m***	**β**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0**	**0**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.03**	**0.1**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.06**	**0.2**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.09**	**0.3**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.12**	**0.4**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.15**	**0.5**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.19**	**0.6**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.22**	**0.7**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.25**	**0.8**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.28**	**0.9**
1,000,000.00	*800,000.00*	*200,000.00*	*0.6*	*0.1*	*0.1*	**0.31**	**1**

This table simulates the β limits for the monitoring effort *m*, under certain conditions (known values for ***L***, ***d***, ***e***, **Δ**, **ρ** and ***c***). In this example the maximum of the options portion, $\beta = 1$, needs the toughest monitoring effort $m = 0.31$. Source: Author

Table 4.4

L	***d***	***e***	q_L	q_H	***z***	***m***	***q(m)***	***tcf***	y_0	ρ	y_1	β	***c***	y_m	***sh***
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0	0.8	140,000.00	-60,000.00	*0.1*	-54,000.00	*0.1*	*0.1*	-5,400.00	-48,600.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.1	0.74	182,000.00	-18,000.00	*0.1*	-16,200.00	*0.1*	*0.1*	-2,120.00	-14,080.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.2	0.68	224,000.00	24,000.00	*0.1*	21,600.00	*0.1*	*0.1*	160.00	21,440.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.3	0.62	266,000.00	66,000.00	*0.1*	59,400.00	*0.1*	*0.1*	1,440.00	57,960.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	***0.4***	***0.56***	***308,000.00***	***108,000.00***	*0.1*	***97,200.00***	*0.1*	*0.1*	**1,720.00**	***95,480.00***
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.5	0.5	350,000.00	150,000.00	*0.1*	135,000.00	*0.1*	*0.1*	1,000.00	134,000.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.6	0.44	392,000.00	192,000.00	*0.1*	172,800.00	*0.1*	*0.1*	-720.00	173,520.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.7	0.38	434,000.00	234,000.00	*0.1*	210,600.00	*0.1*	*0.1*	-3,440.00	214,040.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.8	0.32	476,000.00	276,000.00	*0.1*	248,400.00	*0.1*	*0.1*	-7,160.00	255,560.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	0.9	0.26	518,000.00	318,000.00	*0.1*	286,200.00	*0.1*	*0.1*	-11,880.00	298,080.00
1,000,000.00	*800,000.00*	*200,000.00*	*0.2*	*0.8*	*1.5*	1	0.2	560,000.00	360,000.00	*0.1*	324,000.00	*0.1*	*0.1*	-17,600.00	341,600.00

Table 4.4 simulates the results y_m and *sh* for an expectation of $z = 1.5$. Under these conditions (given values for ***L***, ***d***, ***e***, q_L, q_H, ρ , β and ***c***), the table shows the results for ***m***, ***q(m)***, ***tcf***, y_0, y_1, y_m and ***sh***. As shown in the next tables 4.5, $\beta = 0.1$ optimizes y_m with a monitoring effort $m = 0.4$; $\beta = 0.2$ optimizes y_m with a monitoring effort $m = 0.8$. The appropriate maximum will be $\beta = 0.25$ for a monitoring effort $m = 0.9$. For an expectation of $z = 1.4$ β varies from 0.15 to 0.25 for the monitoring effort, *m*, varying from 0.5 to 0.8; and for an expectation of $z = 1.3$ β varies from 0.25 to 0.35 for the monitoring effort, *m*, varying from 0.7 to 0.9. The next Tables 4.4.1, 4.4.2 and 4.4.3 summarize the approximate results of this simulation for $z = 1.5$, $z = 1.4$ and $z = 1.3$, respectively, where the bold values are closest to the best. See Tables 4.5.1, 4.5.2 and 4.5.3 below, the results of which are summarized in table 3.5. Summarizing, for specific *z*, increasing β will increase the level of the monitoring effort *m*. Source: Author

Table 4.5.1: Results for $z = 1.5$

	m / β	0.1	0.15	0.2	0.25	0.3
y_m	**0**	-5,400.00	-8,100.00	-10,800.00	-13,500.00	-16,200.00
	0.1	-2,120.00	-2,930.00	-3,740.00	-4,550.00	-5,360.00
	0.2	160.00	1,240.00	2,320.00	3,400.00	4,480.00
	0.3	1,440.00	4,410.00	7,380.00	10,350.00	13,320.00
	0.4	**1,720.00**	6,580.00	11,440.00	16,300.00	21,160.00
	0.5	1,000.00	7,750.00	14,500.00	21,250.00	28,000.00
	0.6	-720.00	**7,920.00**	16,560.00	25,200.00	33,840.00
	0.7	-3,440.00	7,090.00	17,620.00	28,150.00	38,680.00
	0.8	-7,160.00	5,260.00	**17,680.00**	30,100.00	42,520.00
	0.9	-11,880.00	2,430.00	16,740.00	**31,050.00**	45,360.00
	1	-17,600.00	-1,400.00	14,800.00	31,000.00	**47,200.00**
sh	**0**	*-48,600.00*	*-45,900.00*	*-43,200.00*	*-40,500.00*	*-37,800.00*
	0.1	*-14,080.00*	*-13,270.00*	*-12,460.00*	*-11,650.00*	*-10,840.00*
	0.2	21,440.00	20,360.00	19,280.00	18,200.00	17,120.00
	0.3	57,960.00	54,990.00	52,020.00	49,050.00	46,080.00
	0.4	**95,480.00**	90,620.00	85,760.00	80,900.00	76,040.00
	0.5	134,000.00	127,250.00	120,500.00	113,750.00	107,000.00
	0.6	173,520.00	**164,880.00**	156,240.00	147,600.00	138,960.00
	0.7	214,040.00	203,510.00	192,980.00	182,450.00	171,920.00
	0.8	255,560.00	243,140.00	**230,720.00**	218,300.00	205,880.00
	0.9	298,080.00	283,770.00	269,460.00	**255,150.00**	240,840.00
	1	341,600.00	325,400.00	309,200.00	293,000.00	**276,800.00**

Table 4.5.2: Results for $z = 1.4$

	m / β	0.1	0.15	0.2	0.25	0.3
y_m	**0**	*-7,200.00*	-10,800.00	-14,400.00	-18,000.00	-21,600.00
	0.1	*-4,460.00*	-6,440.00	-8,420.00	-10,400.00	-12,380.00
	0.2	*-2,720.00*	-3,080.00	-3,440.00	-3,800.00	-4,160.00
	0.3	*-1,980.00*	-720.00	540.00	1,800.00	3,060.00
	0.4	*-2,240.00*	640.00	3,520.00	6,400.00	9,280.00
	0.5	*-3,500.00*	**1,000.00**	5,500.00	10,000.00	14,500.00
	0.6	*-5,760.00*	360.00	**6,480.00**	12,600.00	18,720.00
	0.7	*-9,020.00*	-1,280.00	6,460.00	14,200.00	21,940.00
	0.8	*-13,280.00*	-3,920.00	5,440.00	**14,800.00**	24,160.00
	0.9	*-18,540.00*	-7,560.00	3,420.00	14,400.00	25,380.00
	1	*-24,800.00*	-12,200.00	400.00	13,000.00	**25,600.00**
sh	**0**	*-64,800.00*	*-61,200.00*	*-57,600.00*	*-54,000.00*	*-50,400.00*
	0.1	*-35,140.00*	*-33,160.00*	*-31,180.00*	*-29,200.00*	*-27,220.00*
	0.2	*-4,480.00*	*-4,120.00*	*-3,760.00*	*-3,400.00*	*-3,040.00*
	0.3	27,180.00	25,920.00	24,660.00	23,400.00	22,140.00
	0.4	59,840.00	56,960.00	54,080.00	51,200.00	48,320.00
	0.5	93,500.00	**89,000.00**	84,500.00	80,000.00	75,500.00
	0.6	128,160.00	122,040.00	**115,920.00**	109,800.00	103,680.00
	0.7	163,820.00	156,080.00	148,340.00	140,600.00	132,860.00
	0.8	200,480.00	191,120.00	181,760.00	**172,400.00**	163,040.00
	0.9	238,140.00	227,160.00	216,180.00	205,200.00	194,220.00
	1	276,800.00	264,200.00	251,600.00	239,000.00	**226,400.00**

Table 4.5.3: Results for $z = 1.3$

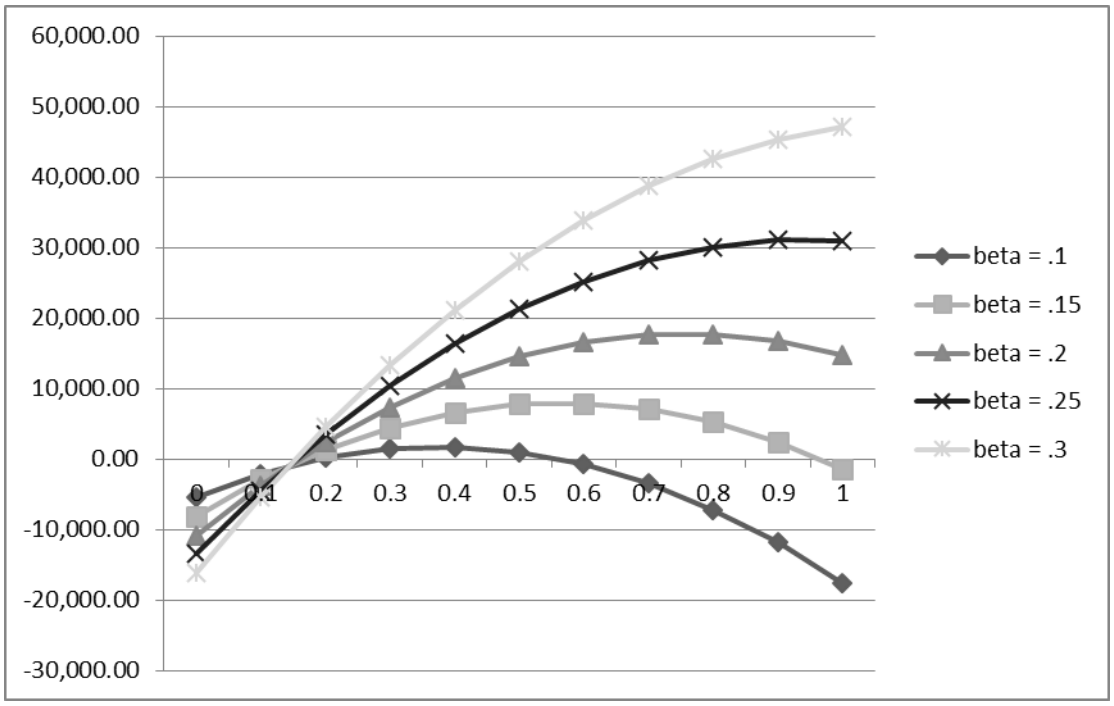
β	m	0.1	0.15	0.2	0.25	0.3	0.35	0.4
y_m	**0**	*-9,000.00*	*-13,500.00*	*-18,000.00*	-22,500.00	-27,000.00	-31,500.00	-36,000.00
	0.1	*-6,800.00*	*-9,950.00*	*-13,100.00*	-16,250.00	-19,400.00	-22,550.00	-25,700.00
	0.2	*-5,600.00*	*-7,400.00*	*-9,200.00*	-11,000.00	-12,800.00	-14,600.00	-16,400.00
	0.3	*-5,400.00*	*-5,850.00*	*-6,300.00*	-6,750.00	-7,200.00	-7,650.00	-8,100.00
	0.4	*-6,200.00*	*-5,300.00*	*-4,400.00*	-3,500.00	-2,600.00	-1,700.00	-800.00
	0.5	*-8,000.00*	*-5,750.00*	*-3,500.00*	-1,250.00	1,000.00	3,250.00	5,500.00
	0.6	*-10,800.00*	*-7,200.00*	*-3,600.00*	0.00	3,600.00	7,200.00	10,800.00
	0.7	*-14,600.00*	*-9,650.00*	*-4,700.00*	**250.00**	5,200.00	10,150.00	15,100.00
	0.8	*-19,400.00*	*-13,100.00*	*-6,800.00*	-500.00	**5,800.00**	12,100.00	18,400.00
	0.9	*-25,200.00*	*-17,550.00*	*-9,900.00*	-2,250.00	5,400.00	**13,050.00**	20,700.00
	1	*-32,000.00*	*-23,000.00*	*-14,000.00*	-5,000.00	4,000.00	13,000.00	**22,000.00**
sh	**0**	*-81,000.00*	*-76,500.00*	*-72,000.00*	*-67,500.00*	*-63,000.00*	*-58,500.00*	*-54,000.00*
	0.1	*-56,200.00*	*-53,050.00*	*-49,900.00*	*-46,750.00*	*-43,600.00*	*-40,450.00*	*-37,300.00*
	0.2	*-30,400.00*	*-28,600.00*	*-26,800.00*	*-25,000.00*	*-23,200.00*	*-21,400.00*	*-19,600.00*
	0.3	*-3,600.00*	*-3,150.00*	*-2,700.00*	*-2,250.00*	*-1,800.00*	*-1,350.00*	*-900.00*
	0.4	24,200.00	23,300.00	22,400.00	21,500.00	20,600.00	19,700.00	18,800.00
	0.5	53,000.00	50,750.00	48,500.00	46,250.00	44,000.00	41,750.00	39,500.00
	0.6	82,800.00	79,200.00	75,600.00	72,000.00	68,400.00	64,800.00	61,200.00
	0.7	113,600.00	108,650.00	103,700.00	**98,750.00**	93,800.00	88,850.00	83,900.00
	0.8	145,400.00	139,100.00	132,800.00	126,500.00	**120,200.00**	113,900.00	107,600.00
	0.9	178,200.00	170,550.00	162,900.00	155,250.00	147,600.00	**139,950.00**	132,300.00
	1	212,000.00	203,000.00	194,000.00	185,000.00	176,000.00	167,000.00	**158,000.00**

These tables 4.5.1 – 4.5.3 simulate the approximations of the best monitoring effort summarized in the next table.
Source: Author

Table 4.6: The approximations (m) vs. the best (m^*) monitoring efforts

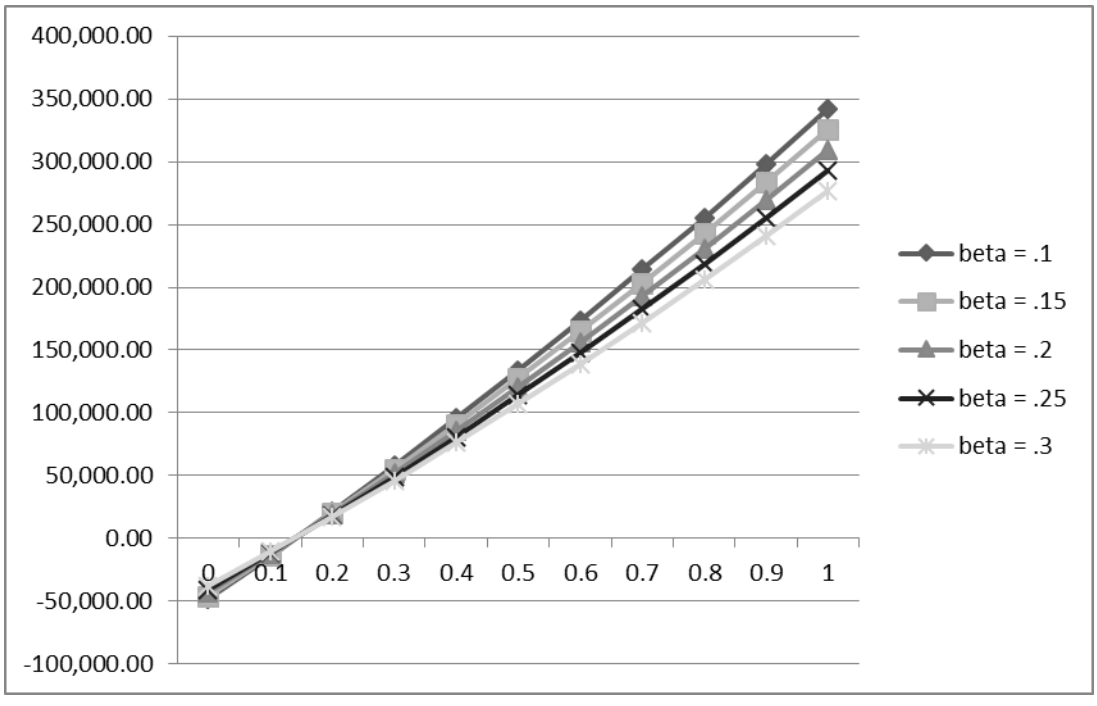
z	β	m	m^*
1.5	0.1	0.4	0.378
1.5	0.15	0.6	0.567
1.5	0.2	0.8	0.756
1.5	0.25	0.9	0.945
1.4	0.15	0.5	0.486
1.4	0.2	0.6	0.648
1.4	0.25	0.8	0.810
1.3	0.25	0.7	0.675
1.3	0.3	0.8	0.810
1.3	0.35	0.9	0.945

Graph 4.1: Manager Incentives (y_m)



This graph depicts the manager incentives influenced by the β values, where the maximum is reachable for β values lower than 0.3, when m varies from 0 to 1, based on the tables 4 above. Source: Author

Graph 4.2: Shareholders' income (*sh*)



This graph depicts the shareholders' income according to the corresponding β values, used in the graph above, when m varies from 0 to 1. Source: Author

4. Bank managerial incentives before and after the 2008 financial crisis: *simulations and empirics based on data from the world´s 100 largest banks*

5.1. Introduction

This chapter complements the study through an empirical analysis of managerial pay in the world's 100 largest banks in early 2017, based on their reports from FY2005 and FY2015. The payment of managers from a sample of 46 of these banks, their assets, variation in equity and other relevant information are analyzed in relation to incentive pay. This is done for the FY2005 and FY2015 seeking to find out what changes occurred in manager payment packages and what effect they had. Given that the start of the 2008 financial crisis fell between these two years, the study also analyzes the impact of the crisis on the possible measures and policies applied by managers, including the level of incentives used in order to keep their harmful effects to a minimum.

The ongoing global crisis continues to engage policymakers in regulations aimed at mitigating such effects. It has been found that external and internal organizational factors encouraged excessive risk-taking, the most predominant factor being managerial pay. Indeed, in an insightful paper, Bhagat and Bolton (2014: 2) list factors influencing the crisis. They also state that "… of the items on the extensive list of factors contributing to the crisis only one issue has consistently been a focal point of the reform agenda across nations: executive compensation." This had already prompted growing interest, which led to the production of research on managerial pay; in some cases, this assesses the merits of the regulations issued while in others, adverse effects resulting from the application of these regulations are analyzed.

This section makes a small contribution to this area of research by assessing the incentive pay for managers from a sample of 46 of the world's 100 largest banks in early 2017. The remainder of this chapter is organized as follows: Section 2 describes the sample selection; the methodology used to analyze the data is presented in section 3 before discussing the results in section 4. The last section concludes and sets out some recommendations. The findings do not confirm hypothesis 3; that is, they do not confirm that options were the main cause of the 2008 financial crisis.

5.2. Data and sample selection

The target population of this study is the world's 100 largest banks based on their assets on 31/12/2016 and distributed across 23 countries. Their grouping by country in early 2017 was as shown in Table 5.1[15]. The data were gathered from the annual reports of these banks.

The first step was to download the banks' annual reports for two fiscal years (FY), one of which was before the height of the financial crisis in 2008 (FY2005) and the other (FY2015) after, to gauge the risks associated with the payment packages in the context of the crisis situation. The choice of these years met the criteria of the time interval for stability purposes as it provides enough time for some corrective or preventive measures to take effect.

Next, the banks were divided into three categories: (a) those that presented detailed payment reports in both FY; (b) those that had a detailed payment report in only one of these FY; and (c) those that presented only condensed reports or simply did not report on payment. The first category consists of 24 banks and the second 22 banks; the remaining 54 banks fell into the third category and were therefore excluded from the study. The first 24 banks were from 9 countries; for the other 22 banks, 3 reports were for FY2005 and 19 for FY2015. This made a sample of 46 banks with a total of 70 reports, which were used to gather information on payment components (base wage, deferred, bonuses, shares and options). Finally, information was collected on total assets, total equity, investment, loans and net income to measure other characteristics with a view to assessing the measures used by the banks to minimize the effects of the crisis. This information was organized into Excel and SPSS tables.

The countries with the most favorable layouts, i.e. with the fullest and clearest data, were UK with 6 banks, Australia with 4, Switzerland with 2 and Denmark with 1 bank that provided both reports with detailed information about managers' and directors' pays. In the other countries, only 2 out of 3 Swedish banks, 5 out of 11 Chinese banks, 2 out of 5 German banks, 1 out of 3 Italian banks and 1 out of 3 Spanish banks had detailed information in both reports. Table 5.2 depicts the usefulness of the reports by country.

[15] http://www.google.pt/largest100banksintheworld (visited on 1.st February 2017)

5.3. Methodology

5.3.1. Variables

Due to the multiplicity of currencies in the sample, and to allow for a reliable comparison, all currencies involved were converted to euro at the exchange rate on 11/07/2017 as more than 50% of the sample reports are from European banks. Exceptionally, the conversion of the Hong Kong dollar to the euro was only made on 18th September 2017.

Start by analyzing the manager *payment* contract in terms of its *total cash*, *shares* and *options* to capture the partial effect of each component on the payment package. Then let us assess the *strength* of the banks in terms of the *assets*, *equity*, and *net income* they were able to collect in both FYs; this indicates the extent to which the banks were able to honor their responsibilities, including the payment of managers. This produces the following equations:

$$Payment = \alpha_0 + \alpha_1 total\_cash + \alpha_2 shares + \alpha_3 options + \varepsilon_1, \quad (1)$$

$$Performance = \beta_0 + \beta_1 assets + \beta_2 equity + \beta_3 income + \varepsilon_2. \quad (2)$$

Given that the *total cash* variable is explained by the variables *base salary* (including fixed salary, benefits and pensions), *bonus*, and *deferred* (including short- and long-term incentives, stock sales, stock purchases and option exercises), the study analyzes the correlations between these variables with the aim of splitting the partial effect of *total cash* into its components, as per the next equation.

$$Total\ cash = \gamma_0 + \gamma_1 base\_salary + \gamma_2 bonus + \gamma_3 deferred + \varepsilon_3. \quad (3)$$

Although *deferred* reports maturations from the last three to five fiscal years, it is only included when it was traded in the current fiscal year. Shares and options are considered when they are granted but not yet converted or exercised. Exercising options to acquiring stock is considered a purchase of common stock in the calculation of *deferred* (Bhagat and Bolton, 2014). Hence, managerial pay includes the cumulative amount of shares to be converted and options to be exercised, in addition to cash payment.

Additionally, the study analyzes the *Performance* variable in terms of *investment*, *loans* and *payment*, through equation (4), to capture additional characteristics related to bank effectiveness.

$$Strength = \mu_0 + \mu_1 payment + \mu_2 investment + \mu_3 loans + \varepsilon_4. \quad (4)$$

5.3.2. Descriptive statistics

In order to benefit from elasticity and to relate variables of different characteristics, the following variables were all logarithmized: *asset*, *equity*, *income*, *total cash*, *shares*, *options*, *investment*, *loans*, and *deferred*. FY2005 and FY2015 are analyzed separately for a better understanding and easier comparison. Start by considering the two first equations.

The correlation of the variables *payment* and *Performance* produce the matrix found in Table 5.3; this shows that in FY2005,

- *asset* has very significant and positive correlations with *equity* ($r = 0.919$; $p < 0.001$) *net income* ($r = 0.755$; $p < 0.001$) and *total cash* ($r = 0.561$; $p = 0.003$), and no significant correlations with *shares* or *options*;
- *equity* has very significant and positive correlations with *net income* ($r = 0.765$; $p < 0.001$) and *total cash* ($r = 0.692$; $p < 0.001$), a significant and positive correlation with *shares* ($r = 0.543$; $p = 0.03$), and a positive but not significant correlation with *options*;
- *net income* has a very significant and positive correlation with *shares* ($r = 0.754$; $p = 0.001$), a significant and positive correlation with *total cash* ($r = 0.422$; $p = 0.032$), and a negative but not significant correlation with *options*;
- *total cash*, *shares* and *options* have no significant correlations with each other.

In FY 2015,

- *asset* has very significant and positive correlations with *equity* ($r = 0.765$; $p < 0.001$) and *net income* ($r = 0.536$; $p < 0.001$), a significant and positive correlation with *total cash* ($r = 0.340$; $p = 0.024$), and no significant correlations with *shares* or *options*;
- *equity* has a very significant and positive correlation with *net income* ($r = 0.452$; $p = 0.004$), a significant and positive correlation with *total cash* ($r = 0.321$; $p = 0.036$), and no significant correlations with *shares* or *options*;
- *net income*, *total cash*, *shares* and *options* have no significant correlations with each other.

These correlations are consistent with the theories of Bolton, Mehran and Shapiro (2010) and Barton and Laux (2010), as a measure of mitigating the risks associated with the financial crisis. As this diversified frame of correlations does not allow the use of a dummy variable for the control of the FYs, run a separate regression in each FY. Given that the internal variable, *payment*, is not defined in the SPSS-table and the correlation of the corresponding external variables is not

sufficiently significant to use PCA for its definition, consider the possibility of using one of the performance variables from equation (2) as a proxy in equation (1).

Correlating these performance variables individually with the payment variables in fiscal year 2005, *assets* and *equity* require the withdrawal of *shares* and *options*, while *net income* only requires the withdrawal of *options* to perform a regression. In regression Table 5.4, it can be seen that *net income*, with the highest explained variance (R^2 = 0.520) and the highest robustness factor (*DW* = 2.127), is the most suitable variable to proxy payment. In fact, more than 60% of the *net income* variation depends on the *shares'* positive variation, because the more than 55% of the negative variation influenced by *total cash* is not significant (p = 0.507). Conversely, for the FY 2015, *net income* has no significant correlation with the external variables *total cash*, *shares* and *options* to run a regression; consequently, it is discarded as a proxy for the variable *payment*. However, *shares* and *options* need to be dropped for the *equity* to be eligible. Table 5.4 again shows the regressions for *asset* and *equity* with very close results, making these variables almost equivalent for the choice to proxy the payment. However, in this case, the choice of *equity* is found to be the most suitable in that it has a higher explained variance (R^2 = 0.614) and higher robustness factor (*DW* = 2.151) as compared to *asset* with 0.467 and 1.392, respectively. In fact, whereas more than 82% of the *equity* variation depends on the *total cash* variation, about 75% of the *asset* variation does so. On the other hand, the more than 10% of the *equity* negative variation depending on shares is not significant (p = 0.808), while the more than 22% of the *asset* negative variation is almost at the limit of significance, with (p = 0.068).

Concerning the payment incentive variables, options are not significant in either FY; as the variable, *options*, is the first to be withdrawn, it confirms its irrelevance as an incentive tool for the banks in these FYs. In fact, in FY2015 only 8 banks in the sample used options; this is a little over half the 15 that did so in FY2005, although not significantly. This confirms the skepticism about the use of options in banking and the restrictive measures taken to mitigate the effects of the financial crisis. While *shares* were the most significant variable in 2005, it had a negative influence in 2015, although it was not significant; *total cash* was the most significant variable in 2015. These results reflect the fact that the payment in FY2005 was mainly explained by stocks (*shares*), with a very small and negative influence of *total cash*, whereas in FY2015 the influence of these variables reversed, suggesting stocks were no longer the preferred incentive. This was certainly a corrective

measure adopted to tackle the financial crisis after its peak in 2008, confirming the reasoning of Bolton, Mehran and Shapiro's (2010).

The short-term incentive variable, *bonus*, is a component of the variable, *total cash*, and it is analyzed within equation (3). Here, *total cash*, the explanatory variable of *payment*, is, in turn, explained by *base salary*, *bonus* and *deferred*, but in general its behavior was the same as that of options and shares when we compare FY2005 and FY2015. Table 5.5 shows that the correlations of these variables were not significant in FY2005; in contrast, in FY2015 only the correlation between *bonuses* and *deferred* is not significant. In fact, the variable *base salary* has very significant and positive correlations with *bonus* ($r = 0.736$; $p = 0.004$) and *deferred* ($r = 0.727$; $p < 0.001$). Joining the explained variable *total cash* into the correlation, Table 5.5 suggests the withdrawal of *bonus* in 2005; on the other hand, in 2015 the model seems to be subject to co-linearity threats because of significant and positive correlations between the external variables.

However, since with ($r = 0.458$; $p = 0.074$) the correlation between *total cash* and *bonus* in 2005 is close to significance ($p = 0.05$), it is included in the regression model. Thus, in FY2005, the regression produces the results shown in Table 5.6, where the significance of bonus is almost equal to 0.01 ($SE = 0.099$, $p = 0.015$, $VIF = 1.066$). In FY2015, the regression produces identical results; however, the lower significance of bonus ($SE = 0.088$, $p = 0.215$, $VIF = 1.429$) means the use of bonuses declined in this FY. Comparing the γ coefficients in both FYs, there is a visible decline in the intercept and the influence of bonus, while base salary and deferred influence increased in FY2015. In general, the influence of the incentive variables *bonus*, *shares* and *options* was lower in FY2015 compared to FY2005. In particular, the variable, *options*, was removed from FY2005 and FY2015 regression models as it was not significant for those models. Indeed, it was used very little in the two FYs: more specifically, it was only used by 13 banks in 2005, and went down to 8 in 2015.

Additionally, the study inspects the banks' *performance* in terms of *investment* and *loans* applied by the banks through equation (4), as well as the manager *payment* represented by *net income* in FY2005 and by *equity* in FY 2015, to measure the banks' operational effectiveness. Given that *payment* is represented by two different variables in FY2005 and FY2015, the study correlates the variables separately. Table 5.7 of these variables only shows a significant and positive correlation between *net income* and *loans* ($r = 0.406$; $p = 0.04$) in FY2005. However, in FY2015

there is also a significant and positive correlation between *equity* and *loans* ($r = 0.354$; $p = 0.021$), together with a very significant and positive correlation ($r = 0.392$; $p = 0.009$) between *equity* and *investment*. Since *performance* is not defined in the SPSS-table, *net income* and *equity* are used as payment proxies for FY2005 and FY2015, respectively. Running the regressions under these conditions, with $R^2 = 0.184$, $F = 3.812$ and $P(F) = 0.037$, Table 5.8 shows that in FY2005 the model is not very robust, as suggested by the corresponding table of correlations, and surprisingly, although both the *investment* and *loans* variables are correlated with *equity*, with $R^2 = 0.101$, $F = 3.292$ and $P(F) = 0.048$, in FY2015, the model is also not very robust. This means that these models are not able to explain a strong causal relationship of performance with investment and loans.

The weakness of the performance indicators may be related to the fact that incentive pay was little used in FY2015, and a possible inadequacy of the proxy variables chosen for the models even though they had previously appeared adequate.

5.3.3. Banks' performance in 2005 and 2015

According to the graphical analysis, the data depicted in Graph 5.1 show that, on average, the Chinese banks had the lowest average pay in both FYs, followed by the Swedish and Italian banks. However, as both China and Sweden are well known for their favorable social policies, this profile may not necessarily represent a disadvantage. The Swiss UBS Group AG was the most generous in paying its senior managers, surpassed only by Deutsche Bank in 2015. The Australian and UK banks are more standardized and paid the highest average wages in both FYs.

The payment weights over the equity demonstrated that manager payment contracts were very protectionist of equity. Only five banks awarded their managers higher than 0.2% of their equity, namely Westpac Banking Corp., UBS Group AG, Lloyds Banking Group and Nationwide Building Society in 2005 and only Intesa Sanpaolo did so in 2015.

All sampled banks except UBS Group AG increased their assets (see Graph 5.2). All sampled banks except Intesa Sanpaolo and Bank of Shanghai increased their equity (see Graph 5.3). With the exception of the Bank of Shanghai which had a decline in equity variation, all sampled Chinese banks increased assets and equity far more than any other bank, when compared to FY2015 (see Graph 5.4). Almost half of the sampled banks (9 out of 24) lowered their investments in FY2015 when compared to FY2005, with UBS GAG experiencing the greatest decrease (from abnormal 2,405,814,840,000 to 57,602,573,490). As for loans/investment, after the removal of the UBS for

being an outlier in FY2005, the four most prominent banks were HSBCH, Ping An bank, Shanghai Pudong Development bank and Barclays Plc. (See graph 5.5).

Overall, the banks did not perform very well. Their capital ratio increased 46%, but the profit ratio stabilized (1.04%) from FY2005 to FY2015, while the ROE decreased 6.77% (from 15.77% to 9%). This reflects an overall positive variation of total assets (of 73.49%), total equity (of 153.48%), loans (of 65.16%), and a decline in investment (of 41.63%), and net income (of 0.2%). Their global ROE decreased (by 61%), showing a downturn in the banks in this period. Indeed, only five banks escaped this trend, namely Commonwealth Bank of Australia, China Merchants Bank, Ping An Bank, Commerzbank and Nationwide Building Society bank (see Table 5.10.(e)). The Deutsche Bank, the Royal Bank of Scotland Group and the Standard Chartered Plc. were the largest contributors to this fall in ROE because of their negative income in FY2015 and the Bank of Shanghai due to its negative equity in FY2015.

Based on some profitability ratios (ROA, ROE, ROI and CAR), the banks performance may be assessed as follows:

- In terms of ROA, the Bank of Shanghai was prominent especially in FY2005 with 38.48% and 18.37% in FY2015, while all other 23 banks stood at below 2%. Apart from the Bank of Shanghai, only 7 banks increased their ROA in FY2015 vis-a-vis FY2005, namely Commonwealth Bank, China Merchants Bank, Industrial Bank Co. Ltd, Ping An Bank, Commerzbank, Skandinaviska Enskilda Banken and Nationwide Building Society (see Graph 5.6).
- Looking at ROE, the Shanghai bank stood out with 181.25% in FY2005 followed by a dramatic drop to -282.67% in FY2015; Intesa Sanpaolo stood out in the FY 2015 with a huge increase to 340.02%. Other than these two banks, only 5 banks increased their ROE in FY2015 vis-a-vis FY2005, namely Commonwealth Bank, China Merchants Bank, Ping An Bank, Commerzbank and Nationwide Building Society (see Graph 5.7).
- In relation to ROI, Westpac Banking Corp and China CITIC Bank Corp stood out in FY2015 with huge increases to 1,059.69% and 1,166.05% respectively. In addition to these banks, four Chinese banks, namely Bank of Shanghai, China Merchants Bank, Industrial Bank Co. Ltd and Ping An Bank, the German Commerzbank, the Swiss UBS Group AG

and the two Swedish banks increased their ROI in FY2015 vis-a-vis FY2005 (see chart 5.8).

- For CAR, the Bank of Shanghai stood out with the highest ratio in FY2005 (21.23%) and the only negative ratio in FY2015 (-6.50%). Apart from this, 6 banks experienced a drop in their ratios, namely, Australia & New Zealand Banking Group, Commonwealth Bank of Australia, National Australia Bank, Ping An Bank, Intesa Sanpaolo, and Nationwide Building Society (see chart 5.9).

Overall, only two banks, namely China Merchants Bank and Commerzbank, saw an increase in all these ratios, and they all declined in the National Australia Bank.

5.4. Results and discussion

In ten years, the world economy underwent many changes triggered by the financial crisis and this was reflected in the banking sector's relationship with the management teams, especially on payment issues, giving preference to cash payment. The results for the proxies for banks' performance did not produce robust regressions. However, loans seem to have been the most stable factor influencing performance in both FYs.

Regarding payment components and incentives, shares were the most significant payment tool in FY2005, but in FY2015 their use fell 44.78%, indicating a negative though not significant influence on payment. The most significant variable was *total cash*, which, in turn, was supported by deferred and bonuses in FY2005; however, in FY2015 it was mainly supported by deferred and base salary, indicating that the banks had difficulty in granting bonuses as a payment tool. Table 5.9 shows how pay components varied from FY2005 to FY2015, the weight of each component of payment and the percentage of base salary, deferred and bonus and total cash. The table shows the marked decline in bonuses, shares and options and the large increase in base salary in FY2015 compared to FY2005.

The most sensitive variables were precisely options and bonuses, which may mean that managers' performance was not sufficient to obtain these incentives or, simply, that the banks were very cautious about granting options or bonuses. Therefore, the adverse effects of the financial crisis probably made financial institutions more reluctant to use bonuses in 2005 and 2015. Thus, these results have a weaker impact than the models of chapters 3 and 4 as they do not strongly validate these models.

5.4.1. Incentive pay

As per the correlations and regressions analysis and aligned with the effect of the 2008 financial crisis, the use of incentives by the 46 sampled banks was not significant.

Shares were granted by 17 banks (about 37%) in FY2005, and rising a little to 26 banks (about 56.5%) in FY2015. Overall, 13 banks (28.26%) granted shares in both FYs, 17 (36.96%) did it in one FY only, and 16 banks (34.78%) did not grant shares in either FY. However, this incentive was the used most than the other two.

Bonuses were granted by 17 banks (about 37%) in one of the FYs. Overall, 6 banks (about 13%) granted bonuses in both FYs, 22 (about 47.8%) did so in one FY only, and 18 banks (about 39.1%) did not grant shares in either FY.

Concerning the options, 15 banks (about 32.6%) granted options in FY2005, falling in FY2015 to 8 banks (about 17.4%); which means that the number of banks that avoided using options rose from 31 (67.4%) in FY2005 to 38 (82.6%) in FY2015. Overall, 4 banks (8.7%) granted options in both FYs, 15 did so in one FY only, and 27 (58.7%) did not grant options in either FY. The use of options was not significant in either FY. In fact, the *options* variable is the first to be excluded from the regression tables, which testifies to its irrelevance as a payment incentive tool for the banks in these FYs. The huge fall in options in FY2015 when compared to FY2005 confirms the general suspicion that options had a negative effect on risk for the banking sector; hence, this type of incentive pay is little used for managers in this sector. In this particular case, the decrease is also confirmed by a very low use of options.

The following country situations here are the most noteworthy: only 1 out of 5 sampled Chinese banks granted options in FY2005 and 1 out of 11 did so in FY2015; 3 out of 6 UK banks granted options in FY2005, but only 1 also did so in FY2015 and 3 did not grant options at all in either FY. The sampled Italian, Spanish and Swedish banks did not grant any options. Equity-based pay was used by about 70% of the sample banks in its stock-based component and by only about 30% in the option-based component. This confirms the banking sector's skepticism about the use of options.

Conclusion

The financial crisis of 2007-09 forced the financial system, and notably the banking sector, to adopt containment measures with a view to cushioning its effect. These measures included restrictions on investments, loans, and in some cases, payment packages for managers, especially incentive pay. The influence of all their three features of incentive pay, namely, bonuses, stock and options, declined in FY2015 compared to FY2005. In particular, options were used very little in the two FYs, thus lowering their influence relative to that of direct stock.

Stock was the most significant variable in FY2005; however, in FY2015 it had a negative, although not significant, influence and total cash became the most significant variable. Similarly, cash payment was mainly supported by deferred and bonuses in FY2005, but in FY2015 the bonus was replaced by base salary, which means that the banks had greater difficulty granting bonuses as a payment tool. Thus, the data indicate that in FY2005, banks mainly used stock-based pay but this policy had to be abandoned to mitigate the financial crisis, and was followed by a move to cash payment, confirming the theories of Bolton et al. (2010) and Barton and Laux (2010).

However, the performance of the banks was not very evident; that is, the proxies used for performance produced very weak regressions. In line with the conclusions of Bolton et al. (2010) on the connection between risk taking and managerial pay in financial institutions, this trend did not influence the bonus incentives, which declined steadily over the years following the peak of the crisis in 2008.

In relation to equity pay, payment packages generally appear to be very protective of equity, especially in FY2015, as options were used very little and stock ceased to be used in FY2015.

In this context, the expected relationship between incentives and the strategies that the manager uses is not evident, as the strategy consisted of avoiding or reducing the use of incentives. Even so, entrepreneurial initiatives will have helped in choosing the strategy that best suits the circumstances imposed by the crisis.

Summarizing, hypothesis 3 is not confirmed due to the little use of incentive pay; options were the least used in both FYs. The fact that stock options were the least used incentive tool by the banks indicates that they were not the main reason for the 2008 financial crisis.

Appendices

Table 5.1: Distribution of the world's 100 largest banks by country

Rank	Country	Number of Banks
1	China	20
2	USA	11
3	Japan	9
4	France	6
5	South Korea	6
6	UK	6
7	Brazil	5
8	Canada	5
9	Germany	5
10	Australia	4
11	Italy	3
12	Netherlands	3
13	Spain	3
14	Sweden	3
15	Singapore	2
16	Switzerland	2
17	Belgium	1
18	Denmark	1
19	India	1
20	Luxembourg	1
21	Norway	1
22	Russia	1
23	Taiwan	1
	TOTAL	100

Source: http://www.google.pt/largest100banksintheworld (visited on 1.st February 2017)

Table 5.2: Usefulness of Reports by Country

Country	Number of Banks				% of detailed Reports
	Total	With 2 detailed Reports	With only 1 detailed Report	With wasted Report	
UK	6	6	0	0	100.00
Australia	4	4	0	0	100.00
Denmark	1	1	0	0	100.00
Switzerland	2	1	1	0	75.00
Sweden	3	2	0	1	66.67
Germany	5	2	1	2	50.00
Italy	3	1	1	1	50.00
Spain	3	1	1	1	50.00
Netherlands	3	0	3	0	50.00
Singapore	2	0	2	0	50.00
India	1	0	1	0	50.00
Norway	1	0	1	0	50.00
Taiwan	1	0	1	0	50.00
China	20	5	6	9	40.00
France	6	0	2	4	16.67
Japan	9	0	2	7	11.11
USA	11	0	1	10	4.55
Belgium	1	0	0	1	0.00
Luxembourg	1	0	0	1	0.00
Russia	1	0	0	1	0.00
Brazil	5	0	0	5	0.00
Canada	5	0	0	5	0.00
South Korea	6	0	0	6	0.00
TOTAL	**100**	**24**	**22**	**54**	**35.00**

Source: Author

Table 5.3: Correlations for equations (1) and (2)

Fiscal Year			Asset	Equity	Net income	Total cash	Shares	Options
2005	Asset	Pearson Correlation	1					
		Sig. (2-tailed)						
		N						
	Equity	Pearson Correlation	**.919(**)**	1				
		Sig. (2-tailed)	**.000**					
		N	**26**					
	Net income	Pearson Correlation	**.755(**)**	**.765(**)**	1			
		Sig. (2-tailed)	**.000**	**.000**				
		N	**26**	**26**				
	Total cash	Pearson Correlation	**.561(**)**	**.692(**)**	**.422(*)**	1		
		Sig. (2-tailed)	**.003**	**.000**	**.032**			
		N	**26**	**26**	**26**			
	Shares	Pearson Correlation	.364	**.543(*)**	**.754(**)**	.344	1	
		Sig. (2-tailed)	.166	**.030**	**.001**	.192		
		N	16	**16**	**16**	16		
	Options	Pearson Correlation	.070	.059	-.266	-.462	.197	1
		Sig. (2-tailed)	.819	.848	.380	.112	.561	
		N	13	13	13	13	11	
Fiscal Year			Asset	Equity	Net income	Total cash	Shares	Options
2015	Asset	Pearson Correlation	1					
		Sig. (2-tailed)						
		N						
	Equity	Pearson Correlation	**.765(**)**	1				
		Sig. (2-tailed)	**.000**					
		N	**43**					
	Net income	Pearson Correlation	**.536(**)**	**.452(**)**	1			
		Sig. (2-tailed)	**.000**	**.004**				
		N	**40**	**39**				
	Total cash	Pearson Correlation	**.340(*)**	**.321(*)**	-.086	1		
		Sig. (2-tailed)	**.024**	**.036**	.599			
		N	**44**	**43**	40			
	Shares	Pearson Correlation	-.037	.261	.238	.361	1	
		Sig. (2-tailed)	.865	.219	.285	.083		
		N	24	24	22	24		
		Pearson Correlation	.030	.128	-.413	.560	.615	1
	Options	Sig. (2-tailed)	.943	.763	.309	.149	.105	
		N	8	8	8	8	8	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 5.4: Regressions for the Payment

FY2005	*Asset =*	20.574	+ 0.388 *total cash*	*Equity =*	16.146	+0.475 *total cash*
	SE	1.791	0.117	*SE*	1.546	0.101
	P	0.000	0.003	*P*	0.000	0.000
	VIF		1.000	*VIF*		1.000
	R^2 = 0.314, *F* =11.002, *P*(*F*) = 0.003, *DW*= 1.095			**R^2 = 0.479, *F* = 22.106, *P*(*F*) < 0.001, *DW* = 0.928**		
	Net income =	17.835	- 0.554 *total cash*	+ 0.603 *shares*		
	SE	3.442	0.228	0.116		
	P	0.000	0.507	0.001		
	VIF		1.134	1.134		
	R^2 = 0.520, *F* = 9.123, *P*(*F*) = 0.003, *DW* = 2.127					
FY2015	*Asset =*	18.601	+ 0.746*total_cash*	- 0.225 *shares*		
	SE	2.267	0.159	0.117		
	P	0.000	0.000	0.068		
	VIF		1.150	1.150		
	R^2 = 0.467, *F* = 11.086, *P*(*F*) = 0.001, *DW* = 1.392					
	Equity =	12.048	+0.828*total_cash*	- .104 *shares*		
	SE	2.011	0.141	0.104		
	P	0.000	0.000	0.808		
	VIF		1.150	1.150		
	R^2 = 0.614, *F* = 19.307, *P*(*F*) < 0.001, *DW* = 2.151					

In this table, there are three candidate regressions for FY2005 and two for FY2015. Using the robustness criterion net income proxies the manager pay, in FY2005, while equity does so in FY2015.

Table 5.5: Correlations for equation (3)

Fiscal Year			Total cash	Base salary	Bonus	Deferred rem.
2005	Total cash	Pearson Correlation	1			
		Sig. (2-tailed)				
		N	26			
	Base salary	Pearson Correlation	**.715(**)**	1		
		Sig. (2-tailed)	**.000**			
		N	**26**	23		
	Bonus	Pearson Correlation	.458	.245	1	
		Sig. (2-tailed)	.074	.360		
		N	16	16	16	
	Deferred rem.	Pearson Correlation	**.685(**)**	.128	-.039	1
		Sig. (2-tailed)	**.000**	.560	.887	
		N	**23**	23	16	23

Fiscal Year			Total cash	Base salary	Bonus	Deferred rem.
2015	Total cash	Pearson Correlation	1			
		Sig. (2-tailed)				
		N	44			
	Base salary	Pearson Correlation	**.937(**)**	1		
		Sig. (2-tailed)	**.000**			
		N	**44**	36		
	Bonus	Pearson Correlation	**.743(**)**	**.736(**)**	1	
		Sig. (2-tailed)	**.004**	**.004**		
		N	**13**	**13**	13	
	Deferred rem.	Pearson Correlation	**.906(**)**	**.727(**)**	.398	1
		Sig. (2-tailed)	**.000**	**.000**	.225	
		N	**36**	**36**	11	36

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.6: Regressions for total cash

FY2005	ln*totalcash* =	2.284	+ 0.424ln*base_salary*	+0.257 ln*defferrem*	+0.282 ln*bonus*
	SE	3.710	0.269	0.054	0.099
	P	0.550	0.141	0.000	0.015
	VIF		1.064	1.002	1.066
	R^2 = 0.682, *F* = 11.738, *P*(*F*) = 0.001, *DW* = 1.977				
FY2015	*lntotalcash* =	1.155	+ 0.538ln*base_salary*	+0.359ln*defferrem*	+0.120ln*bonus*
	SE	1.212	0.132	0.065	0.088
	P	0.372	0.005	0.001	0.215
	VIF		2.526	2.101	1.429
	R^2 = 0.953, *F* = 68.860, *P*(*F*) < 0.001, *DW* = 2.625				

In this table, the change in total cash influencing variables is visible. In FY2005 total cash was mostly explained by deferred payment and bonus, while in FY2015 it was mostly explained by deferred and base salary.

Table 5.7: Correlations for Strength

	FY2005	Net income	Investment	Loans
Net income	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	26		
Investment	Pearson Correlation	.377	1	
	Sig. (2-tailed)	.058		
	N	26	26	
Loans	Pearson Correlation	**.406(*)**	.234	1
	Sig. (2-tailed)	**.040**	.250	
	N	26	26	26

	FY2015	Equity	Investment	Loans
Equity	Pearson Correlation	**1**		
	Sig. (2-tailed)			
	N	43		
Investment	Pearson Correlation	**.392(**)**	1	
	Sig. (2-tailed)	**.009**		
	N	43	43	
Loans	Pearson Correlation	**.354(*)**	.249	1
	Sig. (2-tailed)	**.021**	.112	
	N	42	42	42

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 5.8: Regressions for the strength of the banks

FY2005	*Net income* =	10.625	+0.229 ln*investment*	+ 0.214 ln*loans*
	SE	3.909	0.143	0.118
	P	0.012	0.122	0.084
	VIF		1.058	1.058
	R^2 = 0.184, *F* = 3.812, *P*(*F*) = 0.037, *DW* = 1.508			
FY2015	*Equity* =	14.393	+0.085ln*investment*	+0.294ln*loans*
	SE	3.804	0.092	0.141
	P	0.001	0.385	0.044
	VIF		1.066	1.066
	R^2 = 0.101, *F* = 3.292, *P*(*F*) = 0.048, *DW* = 1.694			

This table shows the regressions of the payment,
represented by net income in FY2005 and by equity in FY2015

Table 5.9: Average weight of the payment components

Financial year	Shares	Options	Total cash	Over the total cash		
				% of base salary	% of deferred	% of bonus
2005	6,959,925	1,555,096	18,341,031.41	16.61	63.67	18.62
2015	3,843,463	129,752	21,669,917.95	35.22	62.42	2.37
Variation	44.78% ↓	91.66% ↓	18.15% ↑	112.04% ↑	1.96% ↓	87.27% ↓

This table shows the changes in the average volume of the payment in FY2005 and FY2015, detailed into shares, options and total cash, with the weight of the components of total cash as a percentage. Source: Author

Table 5.10.a): Financial figures in FY2005 and FY2015

#	Bank	Country	Continent		2005 Total Assets (in €)	2015 Total Assets (in €)	2005 Total Equity (in €)	2015 Total Equity (in €)
1	Australia & New Zealand Banking Group	Australia	Oceania	A&NZBG	196,433,950,000.00	596,233,000,000.00	13,056,960,000.00	38,426,510,000.00
2	Commonwealth Bank of Australia	Australia	Oceania	CwelthBA	220,453,450,000.00	585,208,820,000.00	17,460,200,000.00	35,505,310,000.00
3	National Australia Bank	Australia	Oceania	NAustB	281,123,960,000.00	639,884,840,000.00	22,967,600,000.00	37,193,710,000.00
4	Westpac Banking Corp	Australia	Oceania	Wpac BC	174,034,510,000.00	544,144,520,000.00	11,532,040,000.00	36,123,050,000.00
5	Bank of Shanghai	China	Asia	BoSha	1,278,940,724.00	5,123,400,000.00	271,551,098.00	-292,264,110.00
6	China CITIC Bank Corp	China	Asia	CCITICBC	119,761,217,420.00	701,946,929,380.00	7,072,063,600.00	46,380,993,180.00
7	China Merchants Bank	China	Asia	CMerchB	94,184,732,730.00	701,946,929,380.00	3,333,203,580.00	46,380,993,180.00
8	Industrial Bank Co. Ltd	China	Asia	IBCo. Ltd	60,869,094,476.16	664,824,493,140.00	1,639,214,082.64	40,690,905,170.00
9	Ping An Bank	China	Asia	Ping An B	40,989,506,260.00	610,941,035,390.00	4,297,855,620.00	53,023,937,910.00
10	Shanghai Pudong Development Bank	China	Asia	ShangPDB	73,531,341,648.91	646,736,369,920.00	2,047,444,851.23	40,847,706,000.00
11	Danske Bank	Denmark	Europe	Danske B	327,061,411,600.00	442,826,233,440.00	10,020,104,800.00	21,618,418,400.00
12	Commerzbank	Germany	Europe	C.erzbank	444,861,000,000.00	532,641,000,000.00	13,650,000,000.00	30,407,000,000.00
13	Deutsche Bank	Germany	Europe	DeutscheB	992,161,000,000.00	1,629,130,000,000.00	29,936,000,000.00	67,624,000,000.00
14	Intesa Sanpaolo	Italy	Europe	Intesa SP	263,258,000,000.00	422,360,094,033.00	13,483,000,000.00	817,000,000.00
15	BBVA	Spain	Europe	BBVA	392,389,000,000.00	750,078,000,000.00	17,302,000,000.00	55,439,000,000.00
16	Nordea	Sweden	Europe	Nordea	325,500,000,000.00	646,868,000,000.00	12,900,000,000.00	31,032,000,000.00
17	Skandinaviska Enskilda Banken	Sweden	Europe	SkEBken	196,438,265,100.00	259,455,457,800.00	5,903,944,200.00	14,843,852,100.00
18	UBS Group AG	Switzerland	Europe	UBS GAG	1,868,996,992,500.00	855,297,112,230.00	47,121,131,310.00	51,988,098,360.00
19	Barclays PLC	UK	Europe	Barclays	1,016,792,700,000.00	1,232,013,200,000.00	26,873,000,000.00	72,450,400,000.00
20	HSBC Holdings	UK	Europe	HSBC H	1,318,234,009,900.00	2,114,882,781,520.00	86,210,013,420.00	173,355,623,060.00
21	Lloyds Banking Group	UK	Europe	Lloyds BG	340,729,400,000.00	887,356,800,000.00	11,693,000,000.00	51,678,000,000.00
22	Nationwide Building Society	UK	Europe	NBSociety	122,750,760,000.00	214,303,100,000.00	7,635,100,000.00	9,386,300,000.00
23	Royal Bank of Scotland Group	UK	Europe	RBSG	854,509,700,000.00	896,948,800,000.00	41,298,400,000.00	59,561,700,000.00
24	Standard Chartered Plc	UK	Europe	S.td Ch Plc	236,605,600,000.00	704,531,300,000.00	13,566,300,000.00	53,363,200,000.00
				Global	**9,962,948,542,359.07**	**17,285,682,216,233.00**	**421,270,126,561.87**	**1,067,845,443,250.00**

Table 5.10.b): Financial figures in FY2005 and FY2015

#	Bank	Country	Continent		2005 Investment	2015 Investment	2005 Loans	2015 Loans
1	Australia & New Zealand Banking Group	Australia	Oceania	A&NZBG	4,650,470,000.00	26,974,200,000.00	154,737,840,000.00	376,655,910,000.00
2	Commonwealth Bank of Australia	Australia	Oceania	CwelthBA	6,917,080,000.00	51,805,070,000.00	145,735,720,000.00	428,305,540,000.00
3	National Australia Bank	Australia	Oceania	NAustB	38,837,220,000.00	59,864,500,000.00	174,235,510,000.00	356,965,280,000.00
4	Westpac Banking Corp	Australia	Oceania	Wpac BC	1,626,760,000.00	506,520,000.00	131,044,630,000.00	417,621,720,000.00
5	Bank of Shanghai	China	Asia	BoSha	346,240,815.00	416,717,716.00	0.00	0.00
6	China CITIC Bank Corp	China	Asia	CCITICBC	1,839,788,281.00	19,896,008.00	119,576,994.00	18,562,351,975.00
7	China Merchants Bank	China	Asia	CMerchB	16,911,155,420.00	4,657,741,090.00	64,830,283,970.00	375,031,814,770.00
8	Industrial Bank Co. Ltd	China	Asia	IBCo. Ltd	7,462,561,899.83	28,265,817,650.00	19,077,338,362.77	220,863,136,070.00
9	Ping An Bank	China	Asia	Ping An B	31,635,561,080.00	252,399,334,400.00	195,648,460.00	159,669,015,910.00
10	Shanghai Pudong Development Bank	China	Asia	ShangPDB	4,896,410,137.35	201,266,622,200.00	15,395,813,777.21	276,063,054,100.00
11	Danske Bank	Denmark	Europe	Danske B	487,624,480.00	46,167,521,920.00	111,565,011,440.00	244,877,187,120.00
12	Commerzbank	Germany	Europe	C.erzbank	86,241,000,000.00	82,045,000,000.00	239,877,000,000.00	93,685,000,000.00
13	Deutsche Bank	Germany	Europe	DeutscheB	108,507,000,000.00	34,570,000,000.00	414,860,472,000	427,749,000,000
14	Intesa Sanpaolo	Italy	Europe	Intesa SP	819,000,000.00	28,582,000,000.00	168,343,000,000.00	186,427,000,000.00
15	BBVA	Spain	Europe	BBVA	5,432,000,000.00	68,958,000,000.00	249,397,000,000.00	414,165,000,000.00
16	Nordea	Sweden	Europe	Nordea	3,316,000,000.00	3,680,000,000.00	220,038,000,000.00	365,103,000,000.00
17	Skandinaviska Enskilda Banken	Sweden	Europe	SkEBken	2,358,729,450.00	986,485,500.00	112,146,769,350.00	146,769,915,600.00
18	UBS Group AG	Switzerland	Europe	UBS GAG	2,405,814,840,000.00	57,602,573,490.00	275,428,605,210.00	282,995,310,180.00
19	Barclays PLC	UK	Europe	Barclays	93,721,000,000.00	169,595,800,000.00	295,785,600,000	439,138,700,000.00
20	HSBC Holdings	UK	Europe	HSBC H	115,993,900,000.00	471,850,500,000.00	814,002,200,000.00	1,016,899,400,000.00
21	Lloyds Banking Group	UK	Europe	Lloyds BG	32,120,000,000.00	58,124,000,000.00	227,258,900,000.00	532,931,300,000.00
22	Nationwide Building Society	UK	Europe	NBSociety	23,370,380,000.00	30,542,600,000.00	93,640,910,000.00	159,778,100,000.00
23	Royal Bank of Scotland Group	UK	Europe	RBSG	22,936,100,000.00	90,306,700,000.00	536,594,300,000.00	400,991,800,000.00
24	Standard Chartered Plc	UK	Europe	S.td Ch Plc	33,343,560,970.00	10,803,240,030.00	117,161,923,640.00	225,567,333,690.00
				Global	**3,049,584,382,533.18**	**1,779,990,840,004.00**	**4,581,472,053,203.98**	**7,566,815,869,415.00**

Table 5.10.c): Ratios of financial figures in each FY

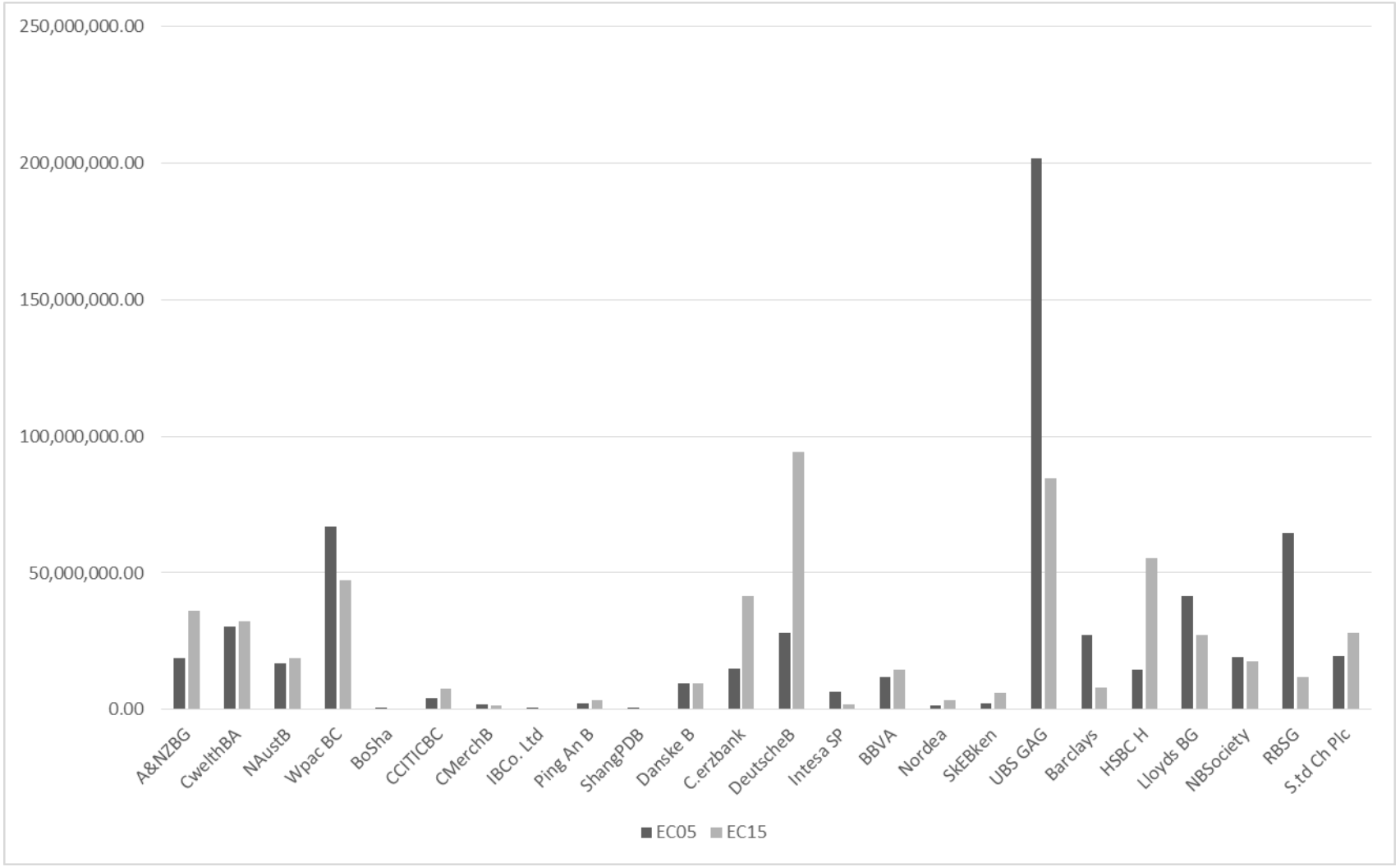
#	Bank	Country	Continent	Acronym	2005 Net Income	2015 Net Income	CAR-05	CAR-15	ROI-05	ROI-15	ROE-05	ROE-15
							TEq/TAs (%)					
1	Australia & New Zealand Banking Group	Australia	Oceania	A&NZBG	2,022,060,000.00	5,029,690,000.00	6.65	6.44	43.48	18.65	15.49	13.09
2	Commonwealth Bank of Australia	Australia	Oceania	CwelthBA	1,673,970,000.00	6,072,210,000.00	7.92	6.07	24.20	11.72	9.59	17.10
3	National Australia Bank	Australia	Oceania	NAustB	3,177,140,000.00	4,282,640,000.00	8.17	5.81	8.18	7.15	13.83	11.51
4	Westpac Banking Corp	Australia	Oceania	Wpac BC	1,888,060,000.00	5,368,040,000.00	6.63	6.64	116.06	1,059.79	16.37	14.86
5	Bank of Shanghai	China	Asia	BoSha	492,197,336.00	826,150,771.00	21.23	-5.70	142.15	198.25	181.25	-282.67
6	China CITIC Bank Corp	China	Asia	CCITICBC	112,033,601.00	231,998,149.00	5.91	6.61	6.09	1,166.05	1.58	0.50
7	China Merchants Bank	China	Asia	CMerchB	480,659,290.00	7,438,487,780.00	3.54	6.61	2.84	159.70	14.42	16.04
8	Industrial Bank Co. Ltd	China	Asia	IBCo. Ltd	314,754,139.69	6,583,070,660.00	2.69	6.12	4.22	23.29	19.20	16.18
9	Ping An Bank	China	Asia	Ping An B	546,815,650.00	8,452,885,300.00	10.49	8.68	1.73	3.35	12.72	15.94
10	Shanghai Pudong Development Bank	China	Asia	ShangPDB	738,785,508.68	6,426,782,670.00	2.78	6.32	15.09	3.19	36.08	15.73
11	Danske Bank	Denmark	Europe	Danske B	1,724,302,560.00	1,764,781,040.00	3.06	4.88	353.61	3.82	17.21	8.16
12	Commerzbank	Germany	Europe	C.erzbank	328,000,000.00	1,177,000,000.00	3.07	5.71	0.38	1.43	2.40	3.87
13	Deutsche Bank	Germany	Europe	DeutscheB	3,529,000,000.00	-6,772,000,000.00	3.02	4.15	3.25	-19.59	11.79	-10.01
14	Intesa Sanpaolo	Italy	Europe	Intesa SP	1,953,000,000.00	2,778,000,000.00	5.12	0.19	238.46	9.72	14.48	7.00
15	BBVA	Spain	Europe	BBVA	3,806,000,000.00	3,328,000,000.00	4.41	7.39	70.07	4.83	22.00	6.00
16	Nordea	Sweden	Europe	Nordea	2,269,000,000.00	3,662,000,000.00	3.96	4.80	68.43	99.51	17.59	11.80
17	Skandinaviska Enskilda Banken	Sweden	Europe	SkEBken	875,362,950.00	1,723,594,950.00	3.01	5.72	37.11	174.72	14.83	11.61
18	UBS Group AG	Switzerland	Europe	UBS GAG	15,897,247,080.00	5,169,054,660.00	2.52	6.08	0.66	8.97	33.74	9.94
19	Barclays PLC	UK	Europe	Barclays	17,338,200,000.00	9,598,600,000.00	2.64	5.88	18.50	5.66	64.52	13.25
20	HSBC Holdings	UK	Europe	HSBC H	16,589,100,000.00	14,874,200,000.00	6.54	8.20	14.30	3.15	19.24	8.58
21	Lloyds Banking Group	UK	Europe	Lloyds BG	2,810,500,000.00	1,051,600,000.00	3.43	5.82	8.75	1.81	24.04	2.03
22	Nationwide Building Society	UK	Europe	NBSociety	240,460,000.00	644,600,000.00	6.22	4.38	1.03	2.11	3.15	6.87
23	Royal Bank of Scotland Group	UK	Europe	RBSG	6,113,800,000.00	-1,303,500,000.00	4.83	6.64	26.66	-1.44	14.80	-2.19
24	Standard Chartered Plc	UK	Europe	S.td Ch Plc	1,729,887,570.00	-1,927,363,320.00	5.73	7.57	5.19	-17.84	12.75	-3.61
				Global	**86,650,335,685.37**	**86,480,522,660.00**						

Table 5.10.d): Variation in ratios from FY2005 to FY2015

#	Bank	Country	Continent		ROA-05	ROA-15	AR	ER	IR	LR	NIR
1	Australia & New Zealand Banking Group	Australia	Oceania	A&NZBG	1,03	0,84	2.04	1.94	4.80	1.43	1.49
2	Commonwealth Bank of Australia	Australia	Oceania	CwelthBA	0,76	1,04	1.65	1.03	6.49	1.94	2.63
3	National Australia Bank	Australia	Oceania	NAustB	1,13	0,67	1.28	0.62	0.54	1.05	0.35
4	Westpac Banking Corp	Australia	Oceania	Wpac BC	1,08	0,99	2.13	2.13	-0.69	2.19	1.84
5	Bank of Shanghai	China	Asia	BoSha	38,48	18,37	3.01	-2.08	0.20	0.00	0.68
6	China CITIC Bank Corp	China	Asia	CCITICBC	0,09	0,03	4.86	5.56	-0.99	154.23	1.07
7	China Merchants Bank	China	Asia	CMerchB	0,51	1,06	6.45	12.91	-0.72	4.78	14.48
8	Industrial Bank Co. Ltd	China	Asia	IBCo. Ltd	0,52	0,99	9.92	23.82	2.79	10.58	19.91
9	Ping An Bank	China	Asia	Ping An B	1,33	1,38	13.90	11.34	6.98	815.10	14.46
10	Shanghai Pudong Development Bank	China	Asia	ShangPDB	1,00	0,99	7.80	18.95	40.10	16.93	7.70
11	Danske Bank	Denmark	Europe	Danske B	0,53	0,40	0.35	1.16	93.68	1.19	0.02
12	Commerzbank	Germany	Europe	C.erzbank	0,07	0,22	0.20	1.23	-0.05	-0.61	2.59
13	Deutsche Bank	Germany	Europe	DeutscheB	0,36	-0,42	0.64	1.26	-0.68	0.03	-2.92
14	Intesa Sanpaolo	Italy	Europe	Intesa SP	0,74	0,66	0.60	-0.94	33.90	0.11	0.42
15	BBVA	Spain	Europe	BBVA	0,97	0,44	0.91	2.20	11.69	0.66	-0.13
16	Nordea	Sweden	Europe	Nordea	0,70	0,57	0.99	1.41	0.11	0.66	0.61
17	Skandinaviska Enskilda Banken	Sweden	Europe	SkEBken	0,45	0,66	0.32	1.51	-0.58	0.31	0.97
18	UBS Group AG	Switzerland	Europe	UBS GAG	0,85	0,60	-0.54	0.10	-0.98	0.03	-0.67
19	Barclays PLC	UK	Europe	Barclays	1,71	0,78	0.21	1.70	0.81	0.48	-0.45
20	HSBC Holdings	UK	Europe	HSBC H	1,26	0,70	0.60	1.01	3.07	0.25	-0.10
21	Lloyds Banking Group	UK	Europe	Lloyds BG	0,82	0,12	1.60	3.42	0.81	1.35	-0.63
22	Nationwide Building Society	UK	Europe	NBSociety	0,20	0,30	0.75	0.23	0.31	0.71	1.68
23	Royal Bank of Scotland Group	UK	Europe	RBSG	0,72	-0,15	0.05	0.44	2.94	-0.25	-1.21
24	Standard Chartered Plc	UK	Europe	S.td Ch Plc	0,73	-0,27	1.98	2.93	-0.68	0.93	-2.11

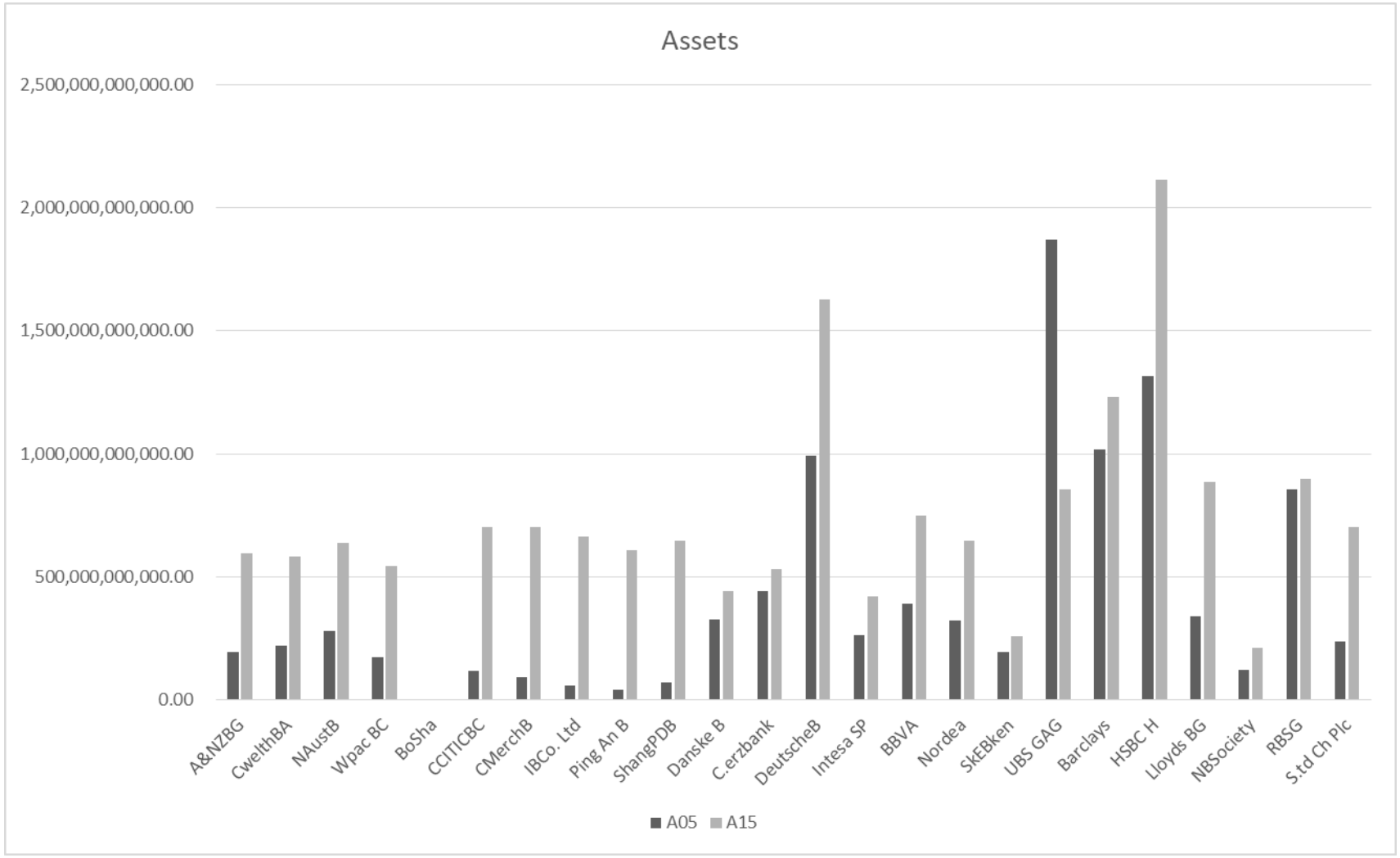
Source: Author

Graph 5.1: Manager's Pay FY2005 and FY2015



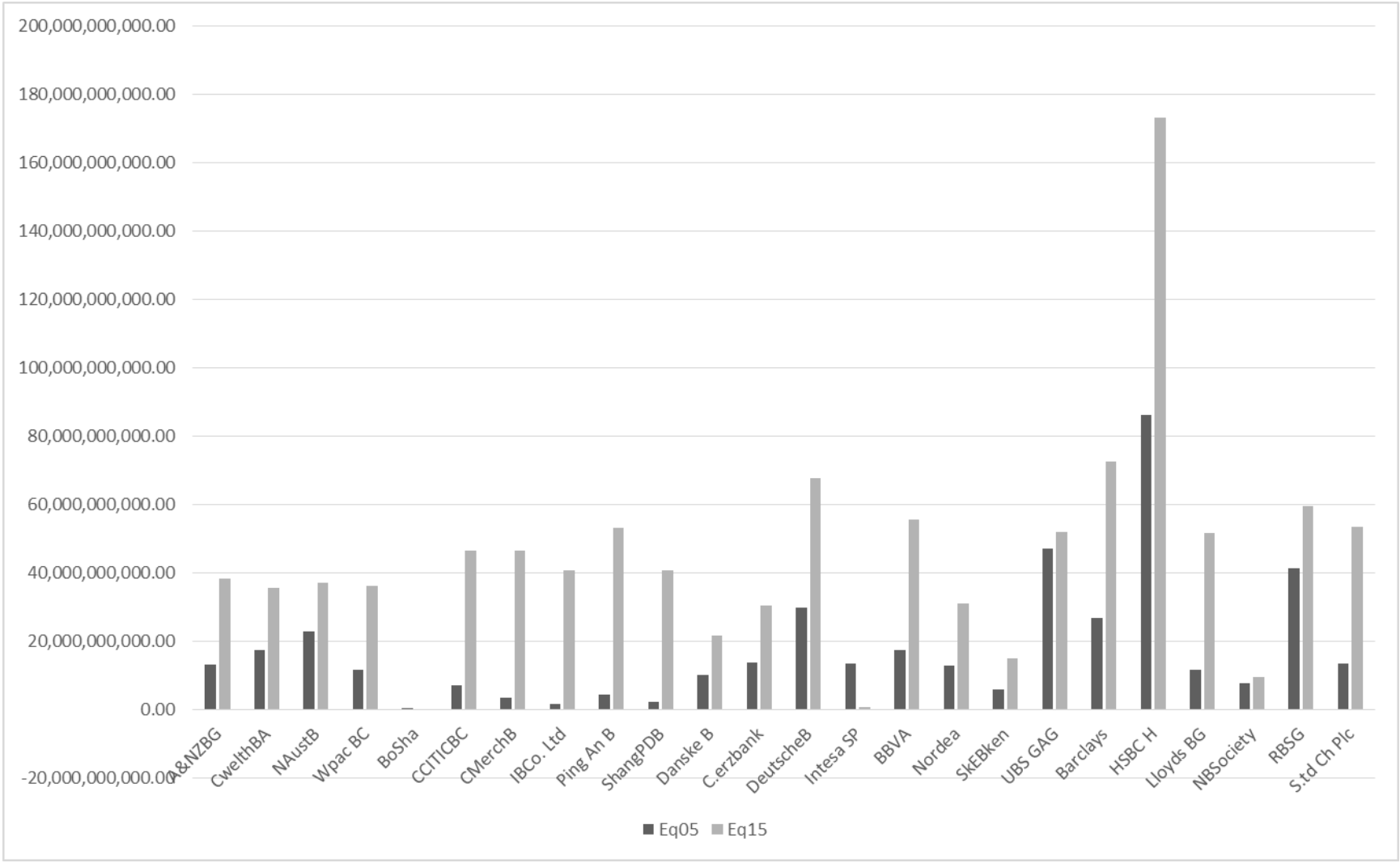
This graph depicts the manager pay in FY2005 and FY2015. Chinese, Swedish and Italian banks manifested a low profile. Source: Author

Graph 5.2: Assets in FY2005 and FY2015



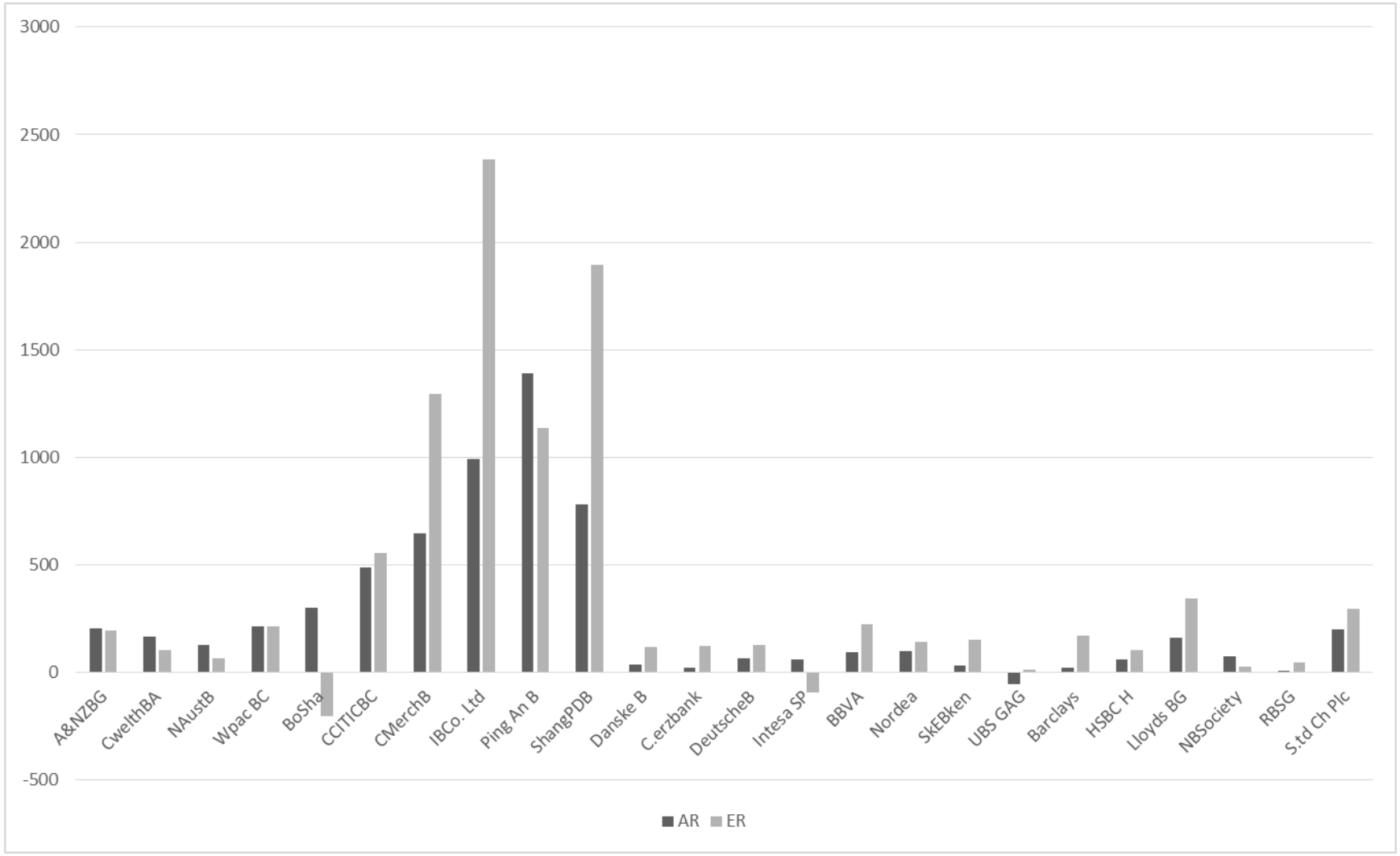
This graph depicts the manager pay variation from FY2005 to FY2015, where all except the Bank of Shanghai and UBS GAG had a positive variation.
Source: Author

Graph 5.3: Equity in FY2005 and FY2015



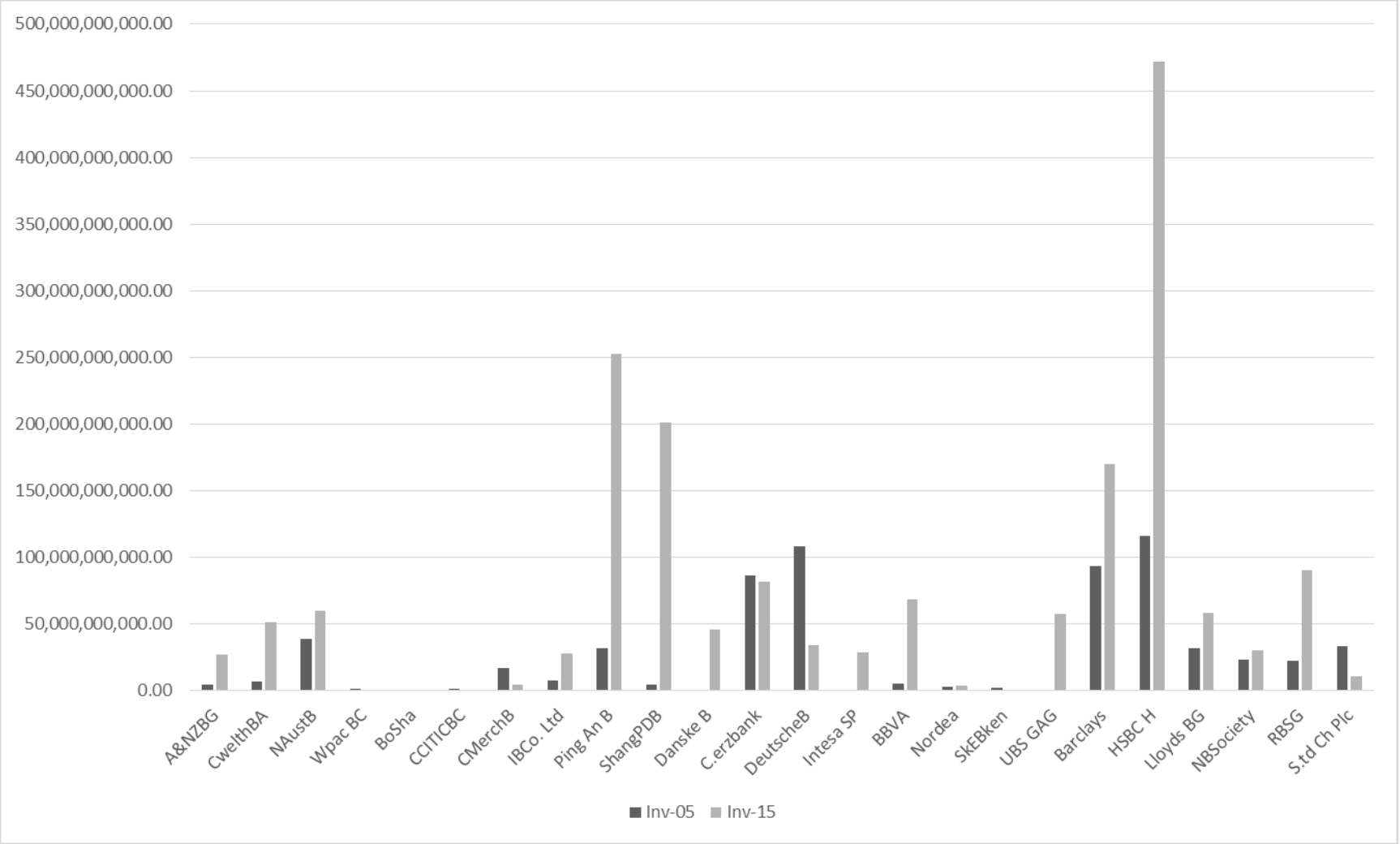
This graph depicts the equity size of the banks in FY2005 and FY2015, where all banks except Intesa Sanpaolo and Bank of Shanghai increased their equity.
Source: Author

Graph 5.4: Asset and Equity variation from FY2005 to FY2015 (%)



This graph depicts the asset and equity ratios from FY2015 compared to FY2005; UBS Group AG had a negative asset variation, while Bank of Shanghai and Intesa Sanpaolo had a negative equity variation. All Chinese banks other than the bank of Shanghai had a very high profile in their assets and equity ratios. Source: Author

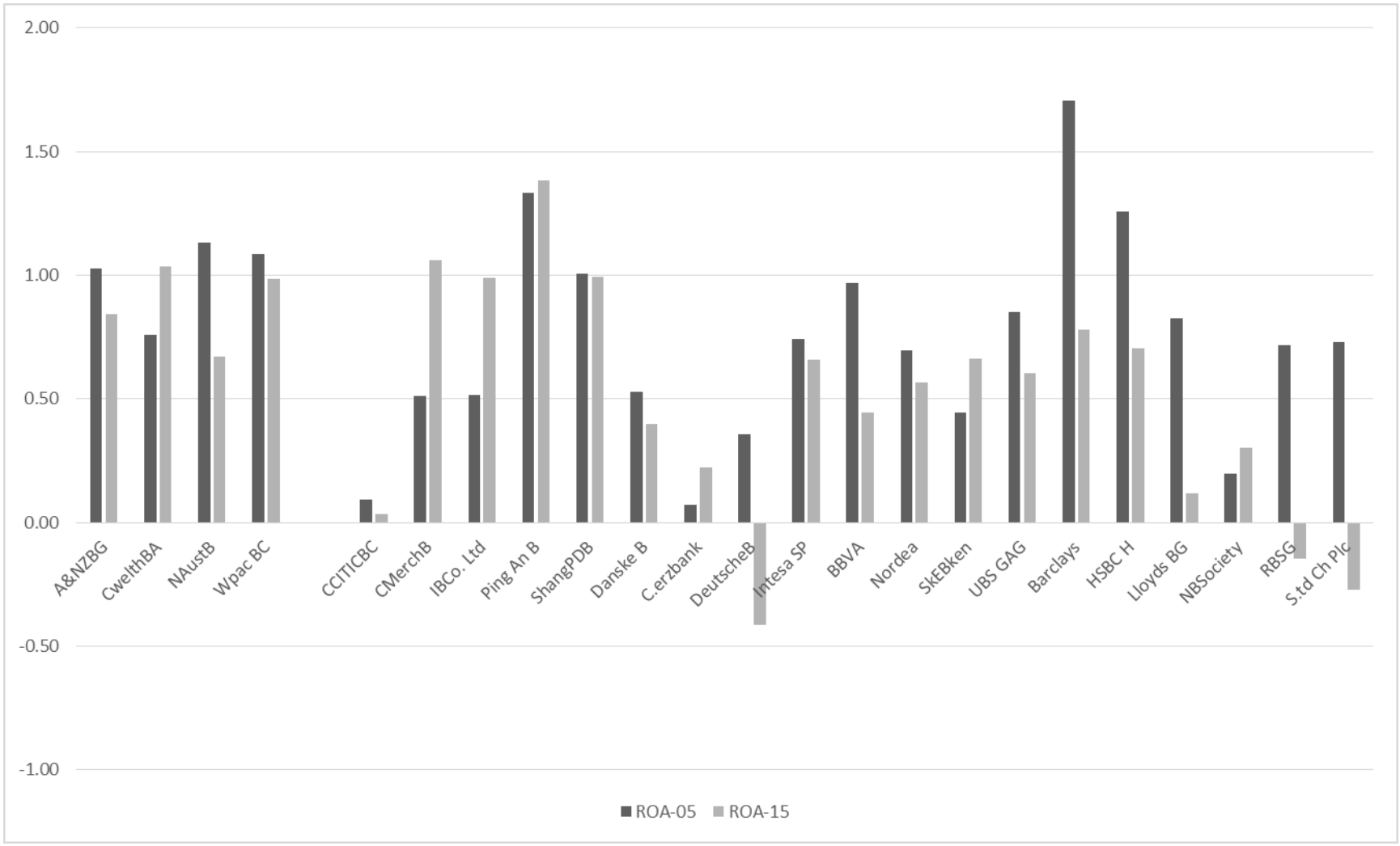
Graph 5.5: Investments in FY2005 and FY2015, without the Swiss UBS Group AG



This graph depicts the behavior of investments in FY2005 and FY2015, where data from UBS Group AG were withdrawn as an outlier in FY2005.

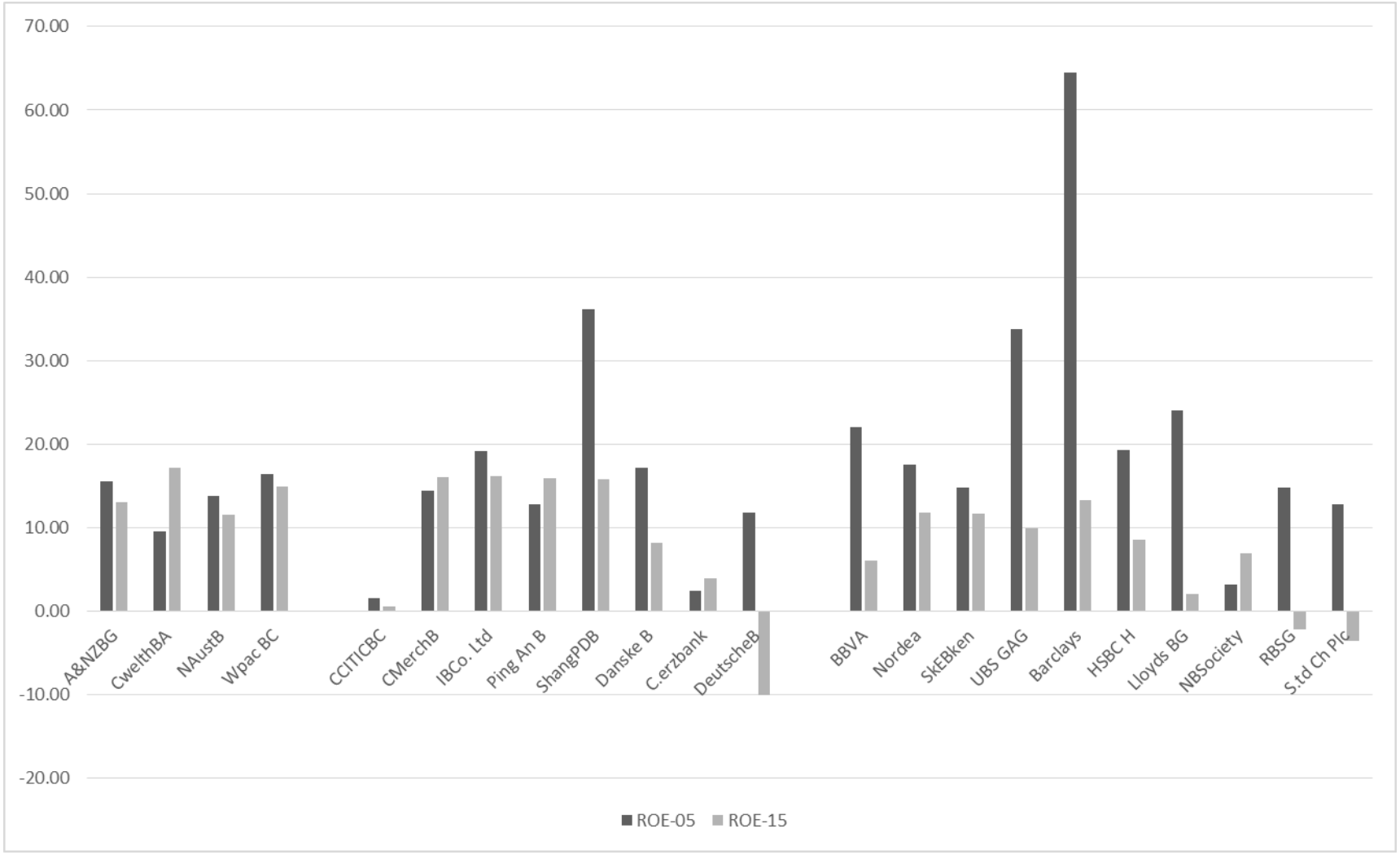
Source: Author

Graph 5.6: Return on asset in FY2005 and FY2015



This graph depicts the behavior of ROA in FY2005 and FY2015 for all banks apart from the Bank of Shanghai which was withdrawn as an outlier. Source: Author

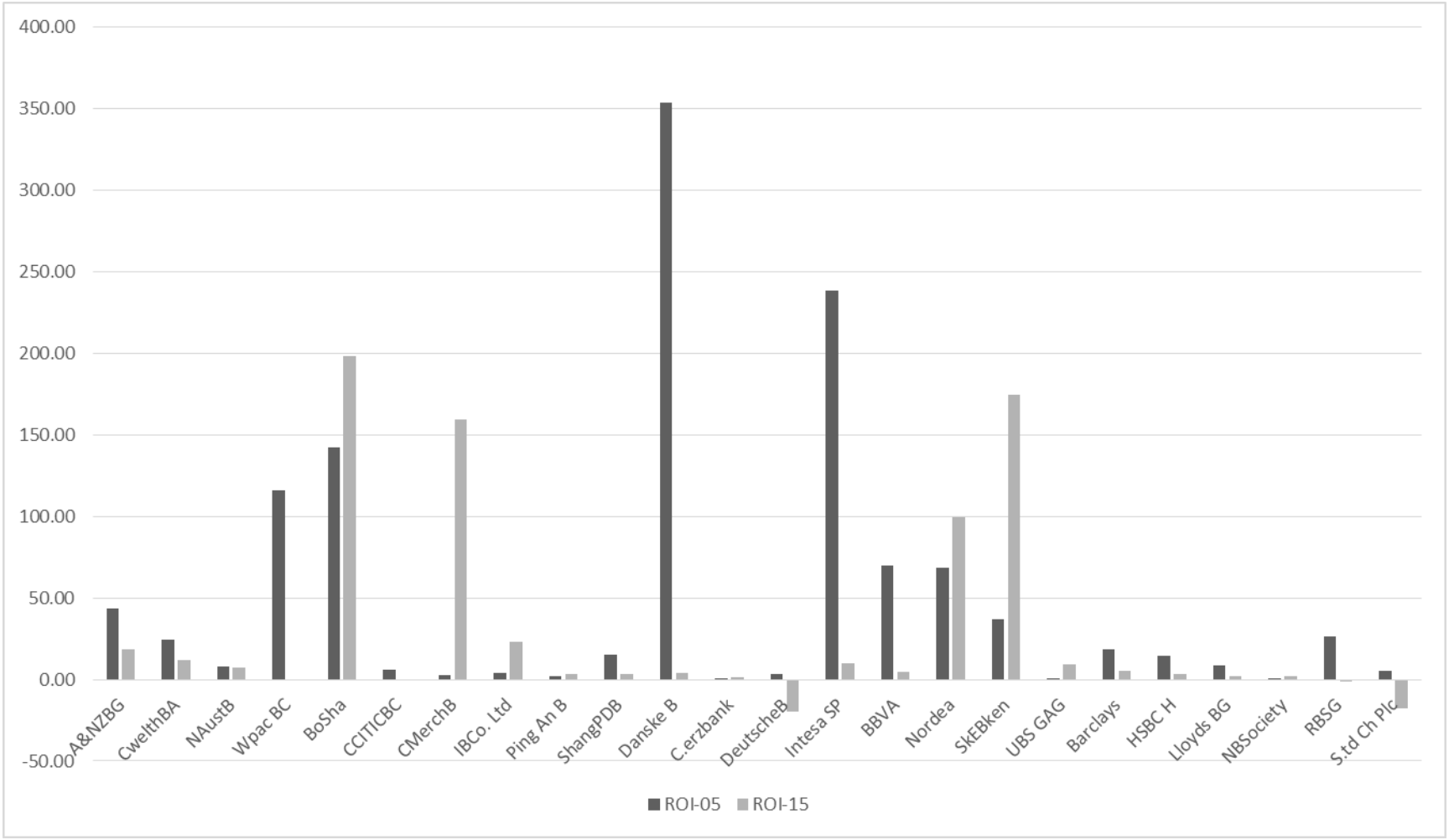
Graph 5.7: Return on equity in FY2005 and FY2015 (%)



This graph shows the bank ROE rates for FY2005 and FY 2015, where data from the Bank of Shanghai and Intesa Sanpaolo were withdrawn as outliers.

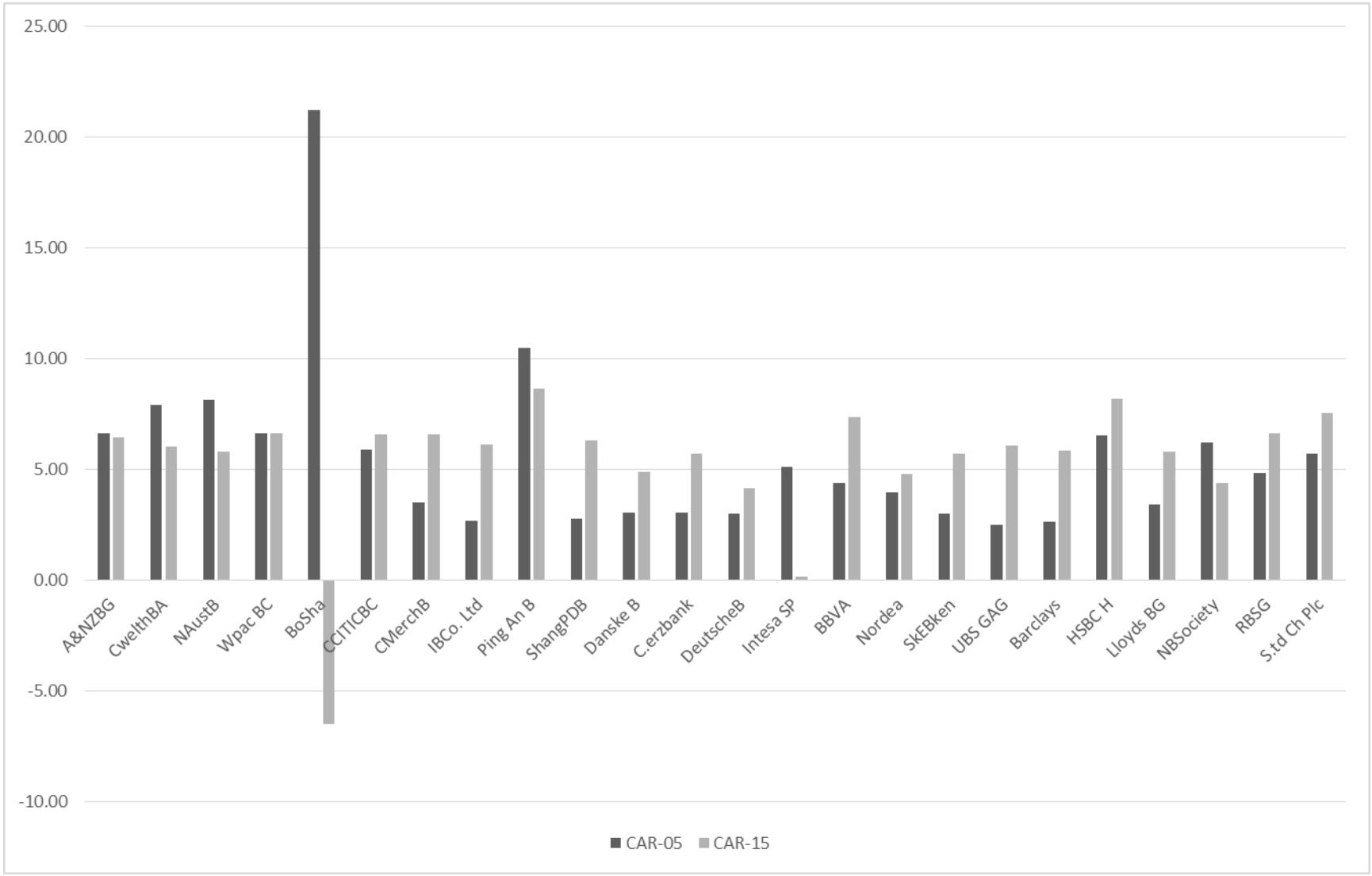
Source: Author

Graph 5.8: Return on investment in FY2005 and FY2015 (%)



This graph shows the bank ROE rates for FY2005 and FY 2015, where data from Westpac Banking Corp and China CITIC Bank Corp were withdrawn as outliers in FY2015. Source: Author

Graph 5.9: Capital adequacy ratios from FY2005 to FY2015 (%)



This graph depicts behavior of capital adequacy ratios for FY2005 and FY2015. Source: Author

6. Conclusions

6.1. Major Conclusions

This study analyzes the risks affecting the managerial process in the banking sector. It seeks to generate analytical solutions to determine the costs of using alternative modes of paying incentives (bonuses, stocks and stock options) and to balance the volume of the use of each one. To this end, two models are developed, supported by an empirical analysis of 46 of the world's 100 largest banks in early 2017 to assess the adequacy of the models.

The first model strives to introduce some improvements to the JSS model (2000), combining it with the Stoughton and Wong (2003) model. Other forms of investment are included to ensure the stability of a prototype of financial institutions with the offsetting effect of a portfolio of diversified services. The model addresses the payment of stock-based incentives and shows how options can be a benchmark incentive tool and their advantages vis-a-vis other stock-based direct incentive alternatives, thus, validating hypothesis 1: "The Stoughton and Wong (2003) conclusion is also valid for the banking sector, i.e. stock options can do at least as well as direct stock in banks".

When balanced optimization is desired, options are the only available alternative. They provide a reference, $y* = \frac{x \cdot (k+n)^2}{\rho k}$, which allows the manager to set goals, given that the number, n or the parameter β, of granted options is known. Options also allow the shareholders to set n optimally, based on the expectations z_h for which $y > kx = e$, as $n^* = \sqrt{\frac{y^* \rho k}{x}} - k$.

Stock alone does not provide a solution for the problem of the optimality of the stock-based incentive pay due to the linearity of the effect of the stock parameter α. Its effect on the payment contract sets no optimum limit in its interval [0,1[. This may only be done by functionally relating the stock parameter α with the options' parameter β, because the latter produces a quadratic effect on the income that provides a dilution effect on the stock value.

The second model is based on the Cerasi and Oliviero (2015) model. It simulates the model but replaces bonuses by options and proves that bonuses are less inefficient than options. It also draws and confirms the following conclusions from this exercise:

(1) Bonuses enhance the conflict of interests between manager and shareholders leading to the need for the latter to conduct additional inspections of managers' activities, while options establish an alignment of interests between the parties;

(2) Bonuses lead to the lowering of shareholders' income expectations, while options do not. The exercising of options has a dilution effect on the stock, but the shareholders' income expectations are not affected. Options have the additional advantage of being processed over a relatively long exercise period;

(3) Bonuses exert pressure on the manager and threaten his/her position in the company because they result in an inspection by shareholders; in contrast, options create secure conditions for the manager to act in a relaxed, but responsible and independent manner because of the alignment of interests with the shareholders;

(4) Nonetheless, bonuses have an advantage over the options when the performance of the manager is poor in that they allow immediate intervention to reverse the harmful situation.

This list of advantages of options vis-a-vis bonuses validates hypothesis 2: "Stock options can do at least as well as bonuses in banks".

As regards the empirical study, the financial crisis of 2007-09 forced the financial system, and notably the banking sector, to take containment measures to cushion its effect. These measures include restrictions on investments, loans, and in most of cases, payment packages for managers, especially the payment of incentives. As a result, the influence of the three abovementioned features of incentive pay, namely, bonuses, shares and options, declined in FY2015 relative to FY2005, confirming the Bolton *et al.*, (2010) theory. In particular, the options were used very little in the two FYs, contradicting hypothesis 3 that stated that "Stock options were the most used incentive tool by the banks". Accordingly, options may have contributed to the 2008 financial crisis, but they were not the principle cause.

In fact, shares were the most significant variable in FY2005 but had a negative, though not significant, influence in 2015 when total cash became the most significant variable. Thus, these data show that banks mainly used equity-based pay in FY2005 but had to abandon this policy to

mitigate the effects of the financial crisis and turn to cash payment, therefore confirming again the Bolton *et al.*, (2010) theory.

This trend did not have any influence on the bonus incentives, which steadily declined in use after the peak of the crisis in 2008; this is again in line with Bolton *et al.*, (2010) conclusions on the link between risk taking and managerial pay in financial institutions. These measures combined with the payment packages seem to have been protectionist of the equity, especially in FY2015.

The cash payment was mainly supported by deferred and bonuses in FY2005, but in FY2015 the bonus was replaced by base salary; this means that the banks had difficulty in granting bonuses as a payment tool. However, the banks' performance was not very evident in that the proxies used for this purpose produced weak regressions and only about 50% of the sampled banks had positive profitability ratios, when comparing the two FYs.

In general, the incentives were sensitive to changes in the market environment, especially when it is affected by a financial crisis such as the one faced in 2008.

Summarizing, this study:

- Introduces some improvements to the JSS (2000) model by combining it with the Stoughton and Wong (2003) model and including other forms of investment to ensure the stability of financial institutions with the offsetting effect of a portfolio of diversified services.
- Showed that, at least for equity-based pay, options emerge as a strong and safe alternative for optimization purposes, although they can encourage managers to run unnecessary risks.
- Showed that the use of options instead of the bonus in the model of Cerasi and Oliviero (2015) relaxes the shareholders' inspection effort and obtains the same or better results.
- Showed that for the purpose of managing loans, options emerge as a facilitating alternative to incentive pay, when compared to the short-term incentive, i.e. bonus.
- Showed that options in general encourage intra-entrepreneurship and strategic planning by the manager.

- Supports scholars defending the usefulness of stock options, despite the influence of the recent financial crisis that contributes to the skepticism of the firms.

However, the use of options by banks was very limited, despite the advantages they bring, confirming the skepticism felt about their use. A plausible explanation for this is that the use of options by banks is generally optional because the banks' liquidity allows them to use other forms of incentive pay, and the time period for banking investment maturation is relatively short, largely as a result of the clients' preferred type of deposits.

In this study, incentives have proven to be directly related to the strategies that the manager uses in cases where they have been used. However, the empirical study showed a broader strand of the strategy, through the manager's entrepreneurial initiatives, which may go through not necessarily being linked to some incentive.

6.2. Limitations and ideas for future research

Mathematical models are designed for cases that reflect normal operating conditions. However, the relaxations to which they are subjected sometimes make them diverge from reality. This conflict is shown in this study by two models that are not perfectly aligned with the results of the world's 100 largest banks, at least not in FY2005 and FY2015. The challenge to circumvent these types of situation may involve modeling for more specific operating conditions.

The banks' performance was not very evident as the proxies used for that produced weak regressions and only about half of the banks had positive profitability ratios. In turn, the significance of all three features of incentive pay, namely, bonuses, shares and options, declined. In particular, the use of options was very limited in both FYs, thus making it difficult to balance with the use of direct stock to confirm the models' results. The diversified exercise prices of options and the diverse share values of the banks also made it difficult to convert options into shares and these into cash.

6.3. Contribution to the Literature

This study attempts to contribute to the evolving body of literature examining payment issues in banking. Chapter 3 examines equity-based incentive pay by taking options as a benchmark, and Chapter 4 compares long-term options with the short-term bonus, seeking the best pay alternative for better corporate performance. At least under normal operating conditions,

the models appear to be appropriate for judging the granting of options in a mutually beneficial manner.

The third chapter starts from the JSS (2000) model and Stoughton and Wong (2003) model. The Stoughton and Wong (2003) model measures the advantages and disadvantages of pure stock and stock options in an industrial competition. This study applies the model to banking and develops useful equations that can help manage the continuous agency conflicts between managers and shareholders. Therefore, it has potential for use as benchmark in future empirical studies on the relationships of banking stakeholders.

Chapter 4 builds on previous studies that address the management control process by shareholders to ensure firms' loan management performance; it therefore also has potential to be used as benchmark in future empirical studies on the bank stakeholders' relationships. Options appear as a simplification tool in this setting, when compared to bonuses. Hence, this study could also be used as reference in future empirical studies on stakeholders' relationships.

Chapter 5 provides an empirical study of the risks faced by the world's 100 largest banks sampled by 46 banks in FY2005 and FY2015, and attempts to test the models developed in chapters 3 and 4. The results generated by the models are close to the actual results in about 50% of the cases (see graphs B). Potentially, this could be even greater if the use of incentives were higher. In this study, the use of options was not significant and a marked drop was seen in the use of bonuses in the 2015 fiscal year compared to the 2005 fiscal year. This study may be continued for updating purposes and to pursue other interesting research avenues.

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Appendices

Numerical Simulation

In contrast to the numerical simulations within the chapters, this simulation uses the actual bank information to measure the closeness of the actual results with those generated by the models in order to assess the validity of the models. For this purpose, one of the 24 banks with information on both FYs was randomly chosen.

Rescuing the simulations of Chapters 3 and 4, consider the Lloyds Banking Group in FY2005; its balance sheet and income statement are shown in Table 0. The bank's top management team consists of six directors, one of whom is the Group Chief Manager. The bank report provides one primary and one parent company balance sheet and income statement.

A – The relationship of the data with the model equations in chapter 3

In order to align this financial year to the proposed model, this study considers the primary balance sheet and income statement as resulting from the bold investment, and the parent company balance sheet and income statement as resulting from the safe investment. Accordingly, adopt the following assumptions: the group balance sheet and income statement represent the bold investment, and the parent company balance sheet and income statement represent the safe investment, i.e., assume that at $t = 1$ the bank applies the investment of the parent company $i_1 =$ 7,923,000,000 in an investment that should be considered safe, divided into (equity: $E =$ 4,645,000,000 + liabilities: $d =$ 3,278,000,000). Further, it engages $i_2 =$ 309,754,000,000 in bold investment, divided into (equity: $E =$ 10,630,000,000 + liabilities: $d =$ 299,124,000,000). Considering the 10% of the income from the safe investment i_1, this will produce the yield $y_1 =$ 792,300,000.

Concerning the bold investment, let us first focus on the payment package for the Group Chief Manager (GCM) and Group Executive Directors (GEDs) that was as per Table A1.1.

The following information refers to the total payment for the entire executive team (GCM + GEDs).

- Fixed salary: 7,226,000.00 (base salary: 3,116,000 + other benefits: 4,110,000.00);
- Cash bonus: 3,129,000.00;
- Pensions: 13,143,000.00;

- Deferred (LTI): 1,518,562.00;
- Number of shares: 1,682,834, of which 1,391,339 result from exercising options, 907,780 at the exercise price of £6.94, 266,796 at the exercise price of £7.33, and 216,763 at a total exercise price of £1; and
- Number of options: 2,466,011, at the exercise price of £4.7425.
- Basic earnings per share: £0.446.
- Diluted earnings per share: £0.442.

With this package, the bank offers cash payment in FY2005 of £25,016,562.00, in addition to 1,682,834 shares corresponding to £8,255,608.88 and 2,466,011 options. Given that the investment i_2 = 309,754,000,000.00 produced the income y_2 = 22,726,000,000.00, with the proceeds of 2,555,000,000.00, consider the deferred to simulate the α incidence (LTI: 1,518,562.00).

The relationship of deferred with α from FY2005 does not deviate from the standard, although deferred refers to any year earlier than FY2005, within a range of up to five years. Thus, this relationship allows the estimation of α as approximately 0.06% (resulting from the ratio 151,856,200 / 2,555,000,000 = 0.000594348…).

However, the data do not suggest a portion quantifier was used for concession purposes. Thus, as suggested by the model, if any α was used, its value seems to have been randomly set at the beginning of the year.

The 1,682,834 shares have a dilution effect of 0.004 by decreasing the earnings per share from the basic 0.446 to the diluted 0.442. This information allows the estimation of the stock volume as $k \approx$ 185,953,157.

Concerning the management team's pay, given that the fixed salary component is paid out of the bank's operating cash flow, this contract granted the GEDs the total incentive of about 17,666,433, (divided into cash bonus: 3,129,000; deferred (LTI): 2,190,433, corresponding to 1,682,834 shares; and pensions: 12,347,000.00); without the options.

This is a much lower amount than in the model because it is in search of the ideal level, which is usually high. However, this difference gives shareholders a good margin for negotiating payment packages.

The search for the manager's expectations in terms of options leads to the following calculations:

- Given that the stock volume is $k \approx 185{,}953{,}157$, and the net profit is 2,555,000,000, the share value can be estimated as $s \approx 2{,}555{,}000{,}000 / 185{,}953{,}157 \approx 13.74$. As shown next, this result proves to be much higher than the actual share value, which varied from 6.94 to 7.33.
- Given that the equity increase is £2,555,000,000.00, using the highest options exercise price, x = £7.33, the maximum number of options to grant can be calculated as $n = (yk/x)^{0.5} - k = (2{,}555{,}000{,}000 \times 185{,}953{,}157/7.33)^{0.5} - 185{,}953{,}157$, giving n = 68,639,130 stock options for the best alignment of the managers' and shareholders' interests, and for which the management team would earn 503,124,825.00. However, the 2,466,011 granted options are far below the optimal level for the given exercise price, suggesting that other criteria were used to set this level or that options were not the most prominent incentive tool.

Turning to the risk resulting from setting the investment policy, the shareholders need to set a reasonable expectation based on market behavior. However, the manager has a better understanding of this information. The negotiation of the payment package is also based on this information.

To establish the highest reference, assume that the market offers conditions to recover the investment, with a profit rate of 0.4. The rate needs to be quite high in order to tempt the manager. In normal conditions, this investment produces the income z_h = 1.4*309,754,000,000 = 433,655,600,000.00 at t = 2, that should be considered the highest. As a result of the shareholders' risk neutrality, which sets the discount rate to zero, in this case one has $f = d$ = 299,124,000,000.

As suggested by Equation (4) from chapter 3, consider three cases: (a) $z_l \geq f$; (b) $z_l < f < z_i$ and (c) $f \geq z_i$.

The base lines of the three cases are shown in Table A1.2. The first expectations about the results are produced in line with respective investment policies, deduced as follows:

Case (a)

Panel 1 shows the case $z_l \geq f$: Suppose that the expected income is not lower than d, say it is d = 299,124,600,000. Under these conditions, the investment policies can be calculated as follows:

$$q^m = q(f) = q^* = (z_i - zl)/(z_h - z_l) \approx 0.072979, \text{ with}$$

$tcf_2{}^m = tcf_2{}^* \approx 0.07979 \times 309{,}754 \times 10^6 + 0.5 \times 299{,}124 \times 10^6 \times (1 - 0.92021)^2 + 0.5 \times 433{,}655.6 \times 10^6 \times [1 - (0.072979)^2] \approx 367{,}183{,}716{,}684.$

Given that $z_l \geq f$ = 299,124,600,000, from equation (4) it follows that the manager's results would be in accordance with all shareholders' expectations. This investment policy produces an income that is equal to the optimal one: $y_2{}^m = y_2{}^* \approx 57{,}429{,}716{,}684$.

Case (b)

Panel 2 shows the case $z_l < f < z_i$: Suppose that the expected income falls below d, say to 250,000,000,000. Under these conditions, the investment policies can be calculated as follows:

$$q^* = (z_i - z_l)/(z_h - z_l) \approx 0.325, \text{ and } q^m = q(f) = (z_i - f)/(z_h - f) = 0.079, \text{ with}$$

$$tcf_2{}^* \approx 0.325 \times 309{,}754 \times 10^6 + 0.5 \times 25 \times 10^{10} \times 0.675^2 + 0.5 \times (1 - 0.325^2) \times 433{,}655.6 \times 10^6 =$$
$$0{,}5 \times (433{,}655.6^2 \times 10^{12} + 309{,}7542 \times 10^{12} - 2 \times 309{,}754 \times 25 \times 10^{16})/(433{,}655.6 \times 10^6 - 25 \times 10^{10})$$

$$tcf_2{}^* \approx 351{,}548{,}550{,}459; \text{ and}$$

$$tcf_2{}^m \approx 0.079 \times 309{,}754 \times 10^6 + 0.5 \times 25 \times 10^{10} \times 0.921^2 + 0.5 \times (1 - 0.079^2) \times 433{,}655.6 \times 10^6 =$$
$$79 \times 309{,}754 \times 10^3 + 0.5 \times (25 \times 848{,}241 \times 10^4 + 433{,}655.6 \times 993{,}759 +) = 345{,}975{,}268{,}700.20$$

Given that z_l = 250,000,000,000 < f = 299,124,600,000 < z_i = 309,754,000,000, from equation (4), it follows that the manager would choose this last alternative that produces the manager's safest result, 345,975,268,700.20, although a little below the optimal, 351,548,550,459. This investment policy produces the income: $y_2{}^m \approx 36{,}221{,}268{,}700$.

Case (c)

Panel 3 shows the case $f \geq z_i$: For this case, suppose that the manager is aware of some threats and decides to invest less than the volume of deposits, say 250,000,000,000. Under these conditions and from equation (4), the investment policy may be the riskiest, where $q^m = q(f) = 0$ and the expectations are the average of z_i and z_h. Thus, one has:

$$tcf_2^m = 0.5\times25\times10^{10} + 0.5\times433{,}655.6\times10^6 = 341{,}827{,}800{,}000$$

Given that $z_i = 250{,}000{,}000{,}000 < f = 299{,}124{,}600{,}000$, from equation (4) it follows that the manager would use the riskiest investment policy that produces the income $y_2^m = 91{,}827{,}800{,}000$.

Including the safe $tcf_1 = 1.1i_1 = 1.1\times7{,}923{,}000{,}000 = 8{,}715{,}300{,}000$, the final terminal cash flow $tcf = tcf_1 + tcf_2$ is shown in table A0.3, with the predictions made at $t = 0$ (January/2005). Assuming that s was diluted in the operating cash flow, α will focus on the chosen incomes to produce the results summarized in Table A1.3, Table A1.4 and Graph A1 show a simulation of the investment policy in each case, to allow the cases to be assessed individually.

Comparing this with the bank's actual balance sheet and income statement, the simulated results are about 1.5 times higher than the actual results. Models usually require the relaxation of some items, which can cause this kind of disturbance. The use of some excluded relaxation items is expected to make the model robust.

The incentive pay is then defined in accordance with Equation (5) and the proceeds with Equation (6).

B – The relationship of the data with the model equations in chapter 4

Consider again the Lloyds Banking Group in FY2005, (balance sheet and income statement shown in Table 0), with the following information: (equity: $e = 10{,}630{,}000{,}000$, liabilities: $l = 299{,}124{,}000{,}000$).

Suppose that at $t = 0$ the bank applies a loan L with a capital ratio $\rho = 3.44\%$. For the given level of liabilities of the bank, the capital ratio needs to be within the interval [0.034318; 0.0354]. In this case, with the given equity, one has $L \leq e/\rho = 10{,}630{,}000{,}000/0.0344 = 309{,}011{,}627{,}907$. Let L be near this maximum, i.e. $L = 309{,}000{,}000{,}000$. Additionally, suppose that at $t = 1$ the

manager exerts a monitoring effort m that must be at least $q_L = 0.2$ and at most $q_H = 0.8$. Additionally, set $c = 0.1$, and $\beta = 0.02$.

Because of the risk neutrality of shareholders, one has $f = d = 299{,}124{,}000{,}000$ and, to estimate the revenue, the shareholders need to set a reasonable expectation based on the market behavior, although the manager is better informed on this issue. Suppose that the market offers conditions to recover the investment, with an increasing rate of 0.4. Although this may be too high, the study uses this reference to align this example with the model data. This means that in normal conditions this loan will produce $z = 1.4 > 1$, and this shall produce the income $zL = z_h = 1.4*309{,}000{,}000{,}000 = 432{,}600{,}000{,}000$ at $t = 2$.

Within this frame and seeking the optimum incentive pay for the manager with actual data, and following the same process, the most adequate monitoring effort can be computed as

$$m^* = \beta\Delta(1 - \rho)(zL - d)/(cL) = 0.02\times0.6\times0.9656\times123{,}600{,}000{,}000 / 30{,}900{,}000{,}000 \approx 0.05.$$

This produces the next results:

- Probability of loan losses: $q(m^*) = m^*q_L + (1 - m^*)q_H = q_L + (1 - m^*)\Delta = q_H - m^*\Delta \approx 0.8 - 0.4635(0.8 - 0.2) \approx 0.77$;
- Terminal cash flow: $tcf = [1 - q(m^*)](zL - d) \approx 30{,}704{,}003{,}048$;
- Increasing equity: $y_0 = \Delta e = [1 - q(m^*)](zL - d) - e \approx \underline{20{,}074{,}003{,}048}$
- Deducting the minimum capital requirements: $y_1 = (1 - \rho) \times y_0 = (1 - \rho)\{[1 - q(m^*)](zL - d) - e\} \approx 19{,}385{,}112{,}340$;
- The best management incentive pay:
  $y_m = \beta y_1 - 0.5cm^2L = \beta(1 - \rho)\{[1 - q(m^*)](zL - d) - e\} - 0.5cm^2L \approx 348{,}989{,}940$;
- And the corresponding shareholders' profit after dividends:
  $sh = (1 - \beta) \times y_1 + 0.5cm^2L = (1 - \rho)\{[1 - q(m^*)](zL - d) - e\} + 0.5cm^2L \approx 19{,}036{,}122{,}400$.

Including the safe $tcf_1 = 1.1i_1$, the final terminal cash flow $tcf = tcf_1 + tcf_2$ is shown in Table B1.1.

Replicating this procedure for all other sampled banks, the model loans appear closer to those of the actual loans in three Australian and six other banks in FY2005 (see graph B.1). In

FY2015, actual loans are only similar to those of the model for Skandinaviska Enskilda Banken, HSBC Holdings and Nationwide Building Society (see graph B.2).

As for the yields, the actual and the model net incomes are close in half of the sampled banks in FY2005 (see graphs B.4 and B.5). In FY2015, close results can be found in only seven banks (see graphs A2B.6 and B.7).

The chosen bank for the simulation is not included in the set of banks with simulated results close to the actual data. The proximity of the model results with the actual data is better in FY2005 than in FY2015. Nevertheless, the proximity of the results suggests the validity of the model.

From these two particular examples, the results permit the simulation of the corresponding simplified balance sheet and income statement according to Jean Dermine (2003), with a relaxed model as some taxes and dividends are considered nonexistent (see tables A1 and B1).

Table 0: The Lloyds Banking Group balance sheet and income statement for FY2005

BALANCE SHEET

Assets	***Liabilities and Equity***
Assets = 309,754,000,000	Liability = 299,124,000,000
	Equity = 10,630,000,000
Total Assets = 309,754,000,000	**Total = 309,754,000,000**

INCOME STATEMENT

	£
Total income	**22,726,000,000**
Insurance claims	(12,186,000,000)
Total income, net of insurance claims	**10,540,000,000**
Operating expenses	(5,471,000,000)
Trading surplus	**5,069,000,000**
Impairment losses on loans and advances	(1,299,000,000)
Profit/loss on sale and closure of businesses	**50,000,000**
Profit before tax	**3,820,000,000**
Taxation	(1,265,000,000)
Profit for the year	**2,555,000,000**

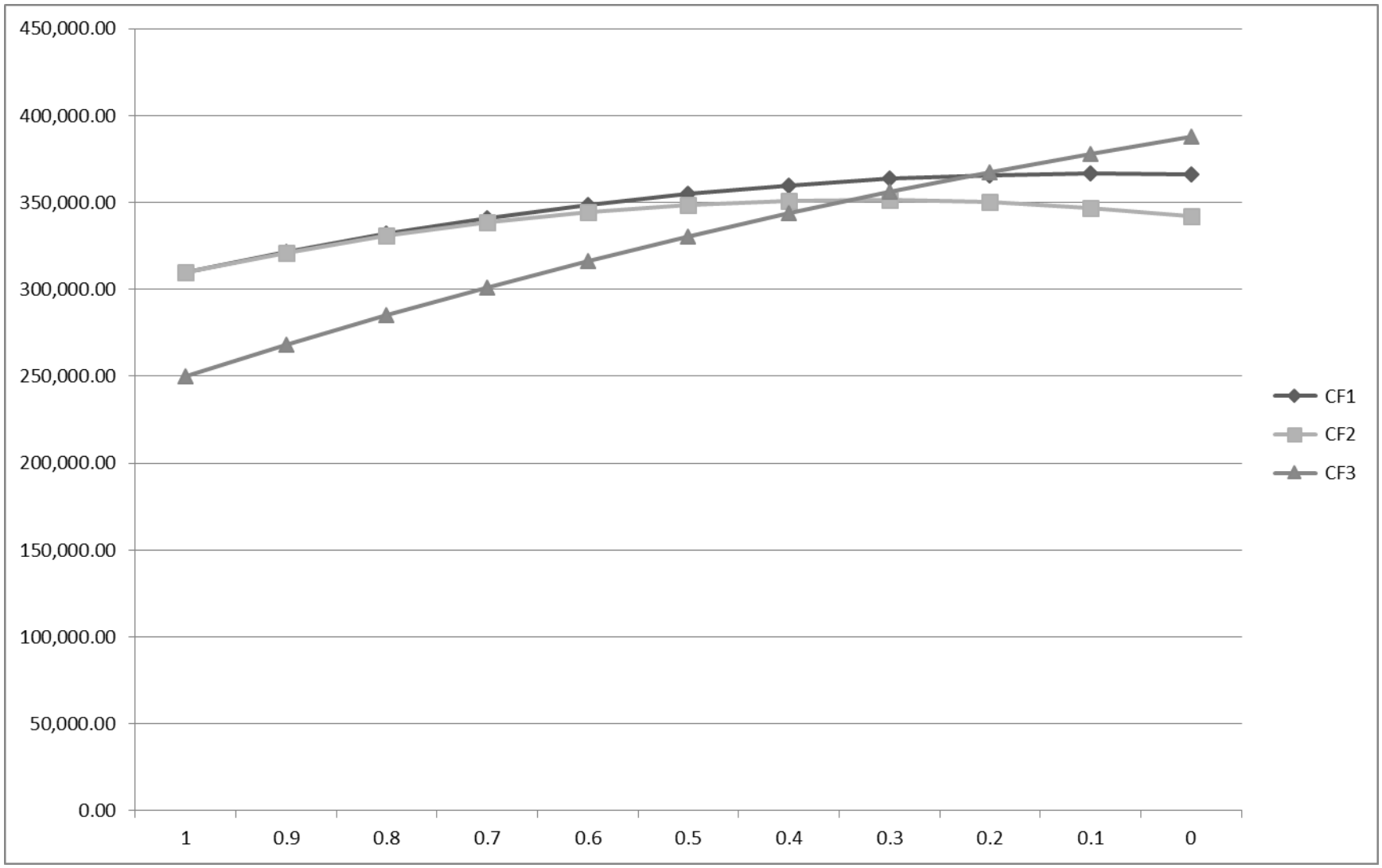
Extracted from Lloyds Banking Group 2005 financial report

Table A0: Outcome behavior

Assumption	1	2	3								
H	433.655,60	433.655,60	433.655,60								
I	309.754,00	309.754,00	250.000,00								
F	299.124,00	299.124,00	299.124,00								
L	299.124,00	250.000,00	341.827,80								
*T**	366.780,14	351.489,50	387.741,70								
q	1	0,9	0,8	0,7	0,6	0,5	0,4	0,3	0,2	0,1	0
*CF*1	309.754,00	321.471,50	331.843,69	340.870,56	348.552,11	354.888,35	359.879,27	363.524,88	365.825,17	366.780,14	366.389,80
*CF*2	309.754,00	321.225,88	330.861,21	338.659,98	344.622,19	348.747,85	351.036,95	351.489,50	350.105,49	346.884,92	341.827,80
*CF*3	250.000,00	267.906,42	284.894,56	300.964,43	316.116,02	330.349,33	343.664,36	356.061,11	367.539,58	378.099,78	387.741,70

Adapted from Lloyds Banking Group financial report in FY2005, this table and the respective graph below simulate the effect of assumptions 1, 2 and 3, for an investment of 309,754.00 million, of which 299,124.00 million are from depositors, when the lowest expectation is equal to, lower than or higher than the depositors' amount. In this case, alternative B proves to be the most realistic.

Graph A: Outcome behavior



This graph depicts the outcome behavior for the three alternatives proposed in definition (3.4). Source: Author

Table A1: Payment plan package

	Basic Salary	Cash bonus	Long Term Incentives	Pension
Group Chief Manager	23%	41%	28%	8%
Other G. M. Directors	24%	38%	29%	9%

Source: Lloyds Banking Group report

Table A2: Summary of the three cases

Investment	**Safe**	**Risky**		**Expected terminal cash flow**
Outcome	z_i	z_h	z_l	***tcf***
Panel 1	309,754,000,000	433,655,600,000	299,124,600,000	367,183,716,684
Panel 2	309,754,000,000	433,655,600,000	250,000,000,000	345,975,268,700
Panel 3	250,000,000,000	433,655,600,000	341,827,800,000	341,827,800,000

This table shows the base line of each paneled alternative. Source: Author

Table A3: Simulation of the predictions of the model in chapter 3

	A - Chosen q	B - Profit (y_2)	C - Equity Increase (y_1+y_2)	D - Incentive pay (α - Incidence)	E - Profit
$z_l < f < z_i$	0.079	36,221,268,700	37,013,568,700	22,208,141	36,991,360,559
$z_l \geq f$	0.073	57,429,716,684	58,222,016,684	34,933,210	58,187,083,475
$f \geq z_i$	0.000	91,827,800,000	92,620,100,000	55,572,060	92,564,527,940

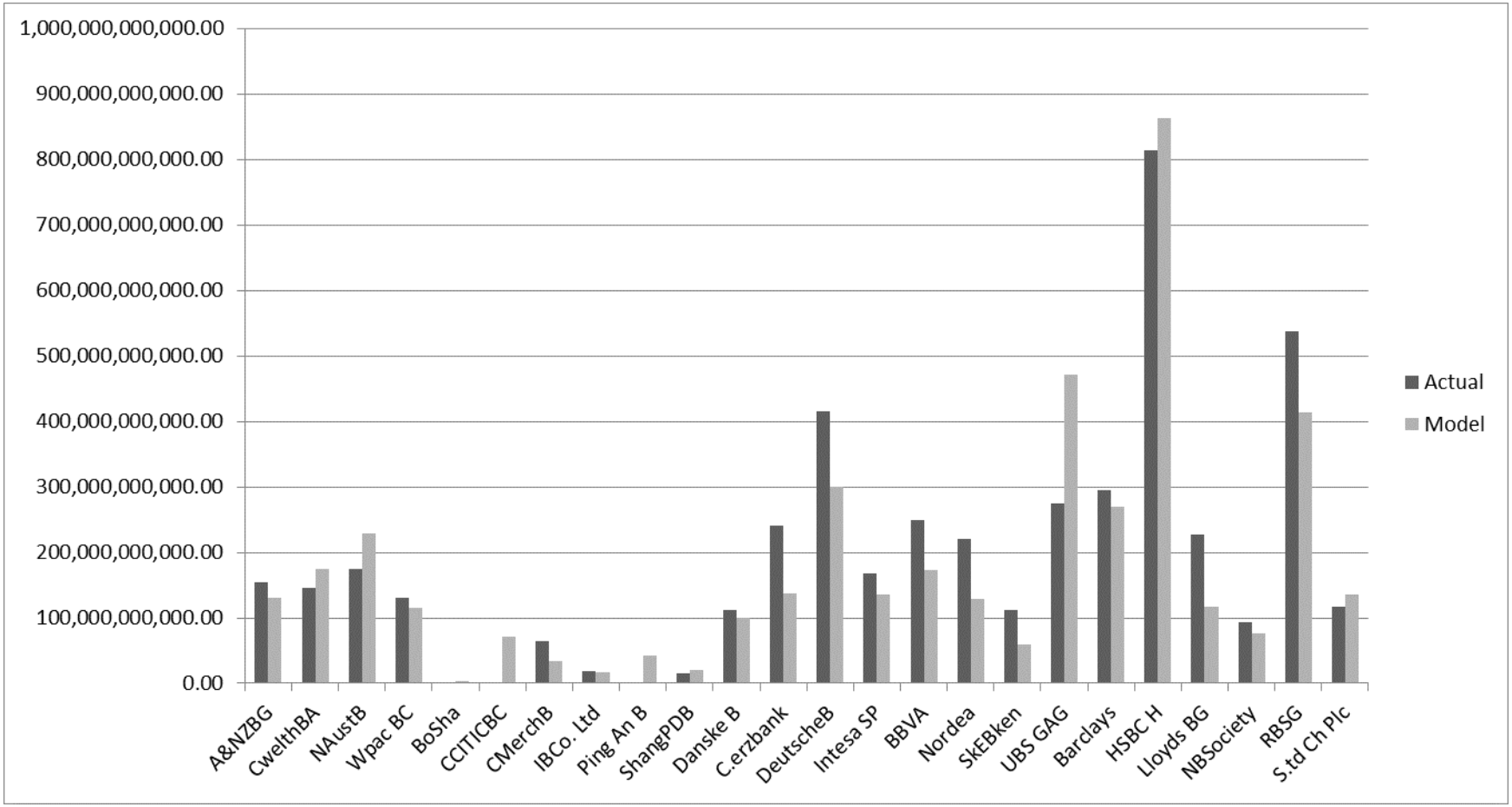
Source: Author

Table B1: Simulation of the predictions of the model in chapter 4

Tcf_1 (safe investment)	Tcf_2 (bold investment)	**Final *tcf***	**Income: *y***
8,715,300,000	30,704,003,048	39,419,303,048	20,866,303,048

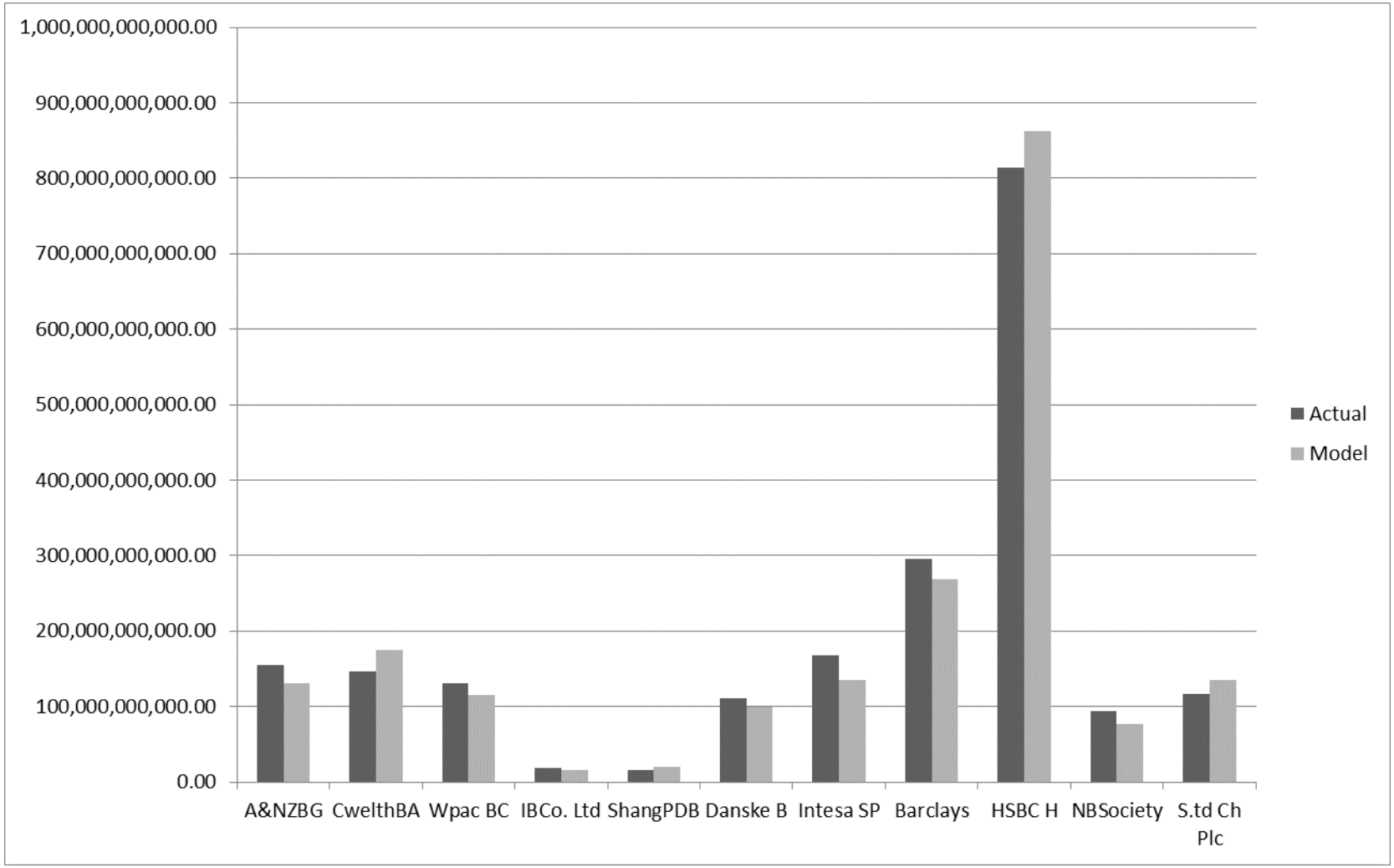
Source: Author

Graph B.1: Loans in FY2005



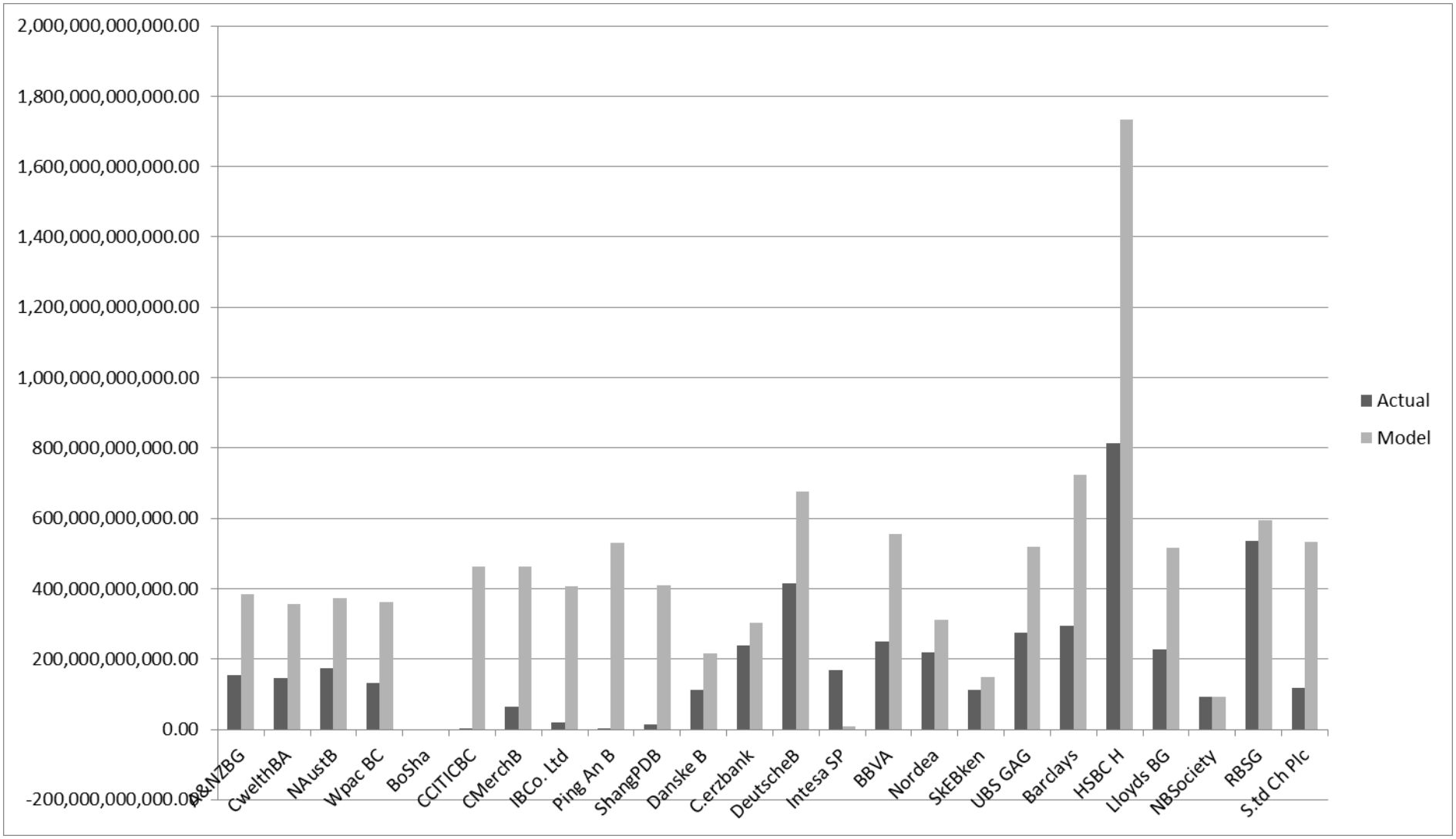
Source: Author

Graph B.2: Banks with closest loans in FY2005



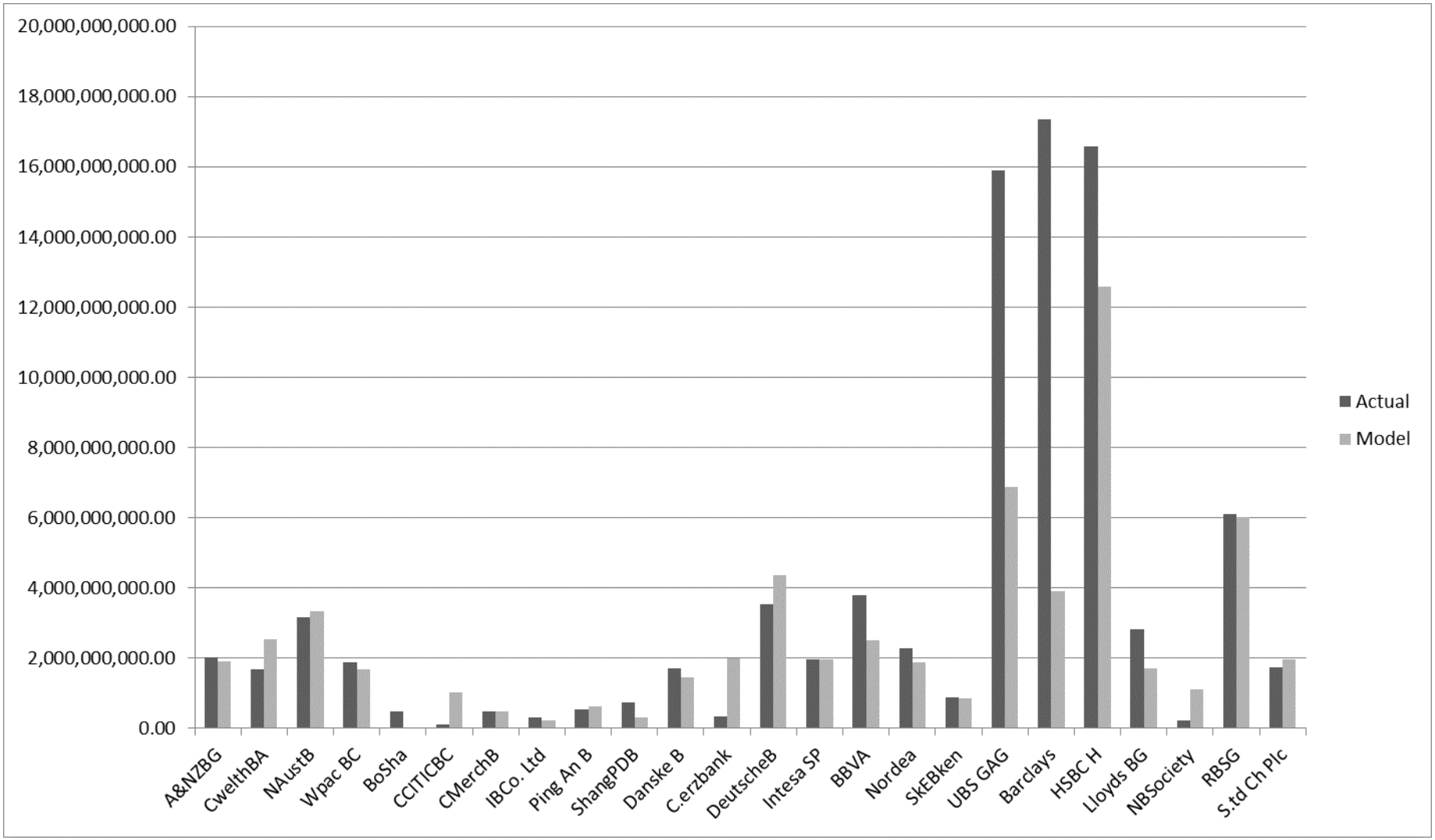
Source: Author

Graph B.3: Loans in FY2015



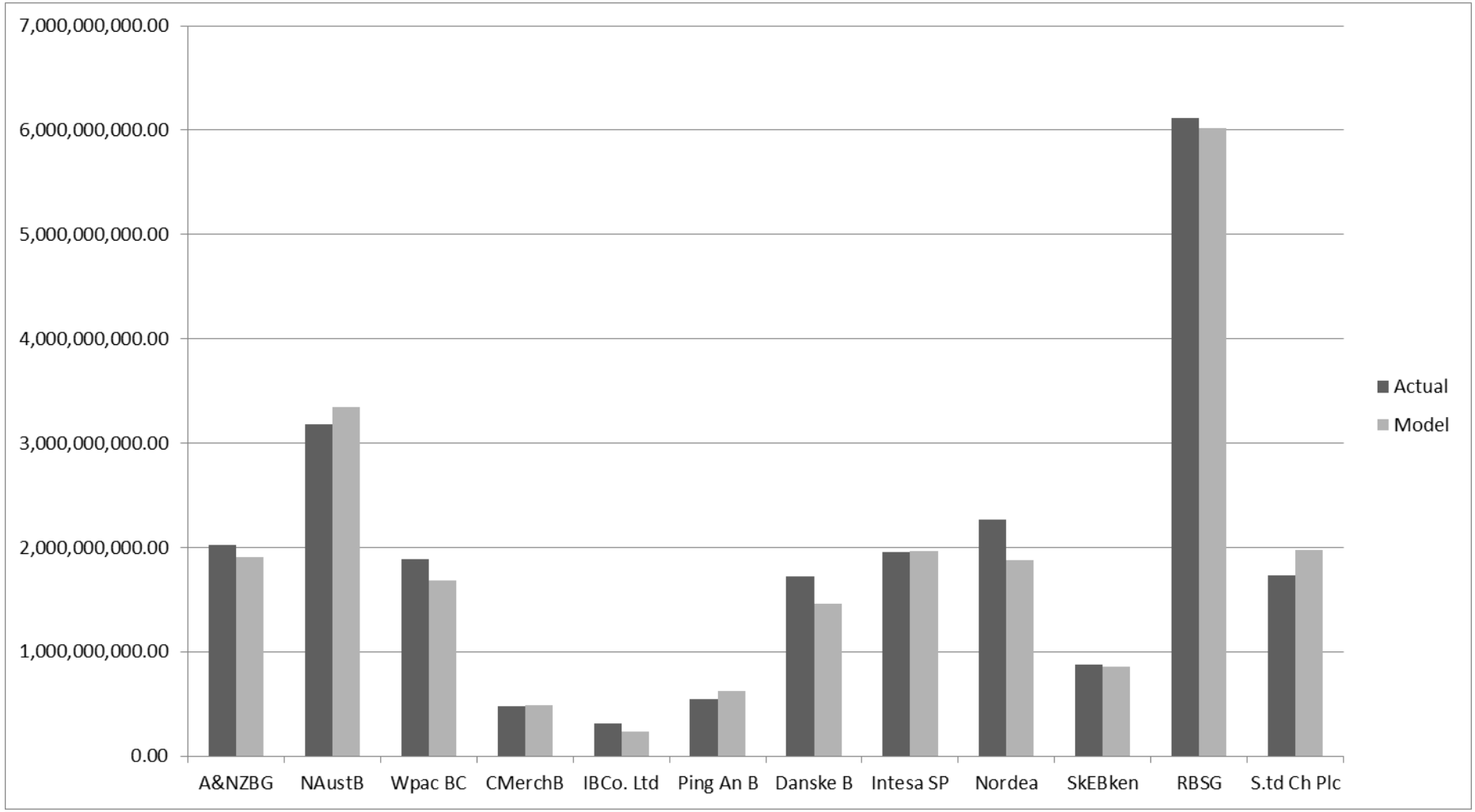
Source: Author

Graph B.4: Profits in FY2005



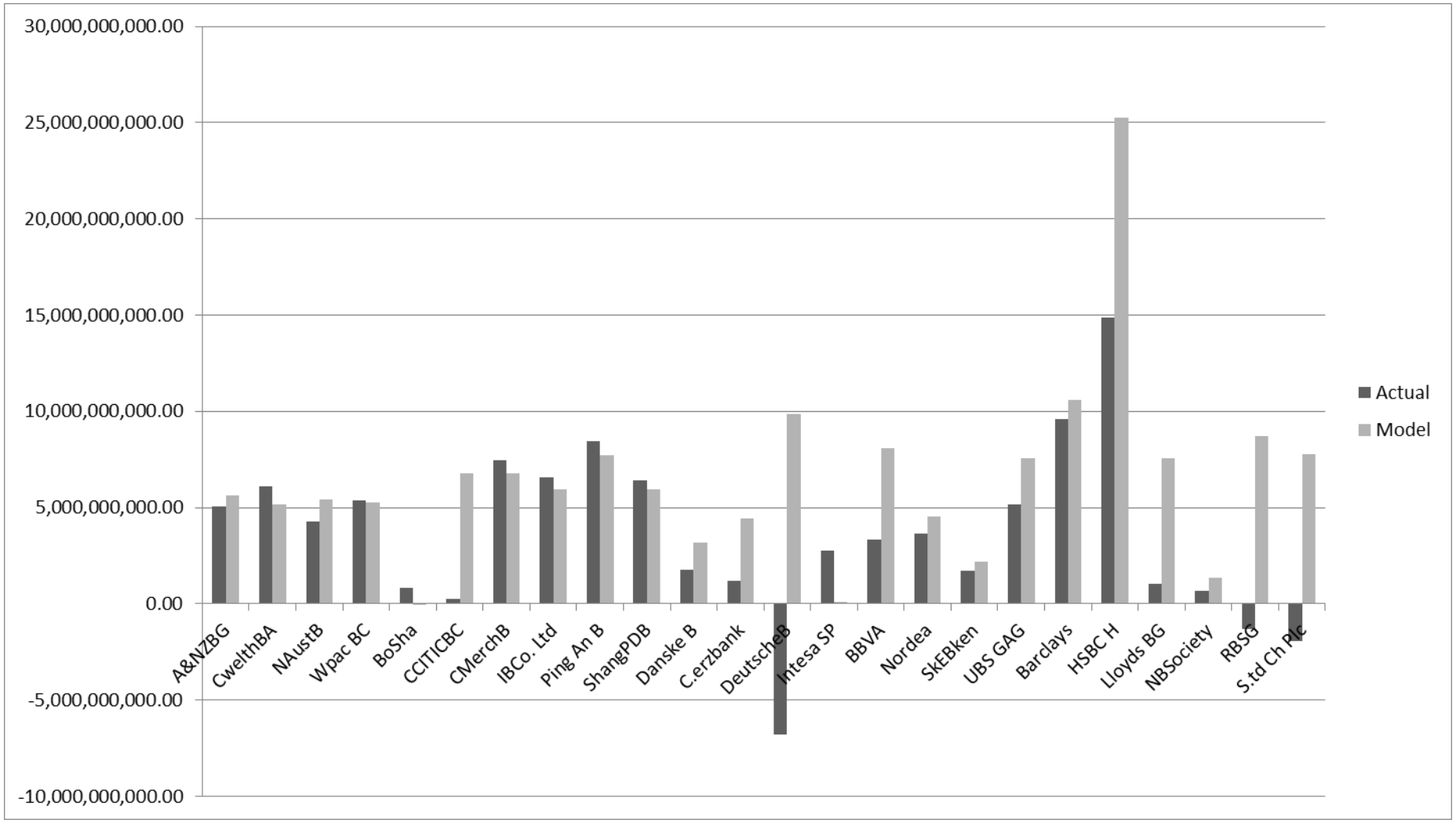
Source: Author

Graph B.5: Banks with closest profits in FY2005



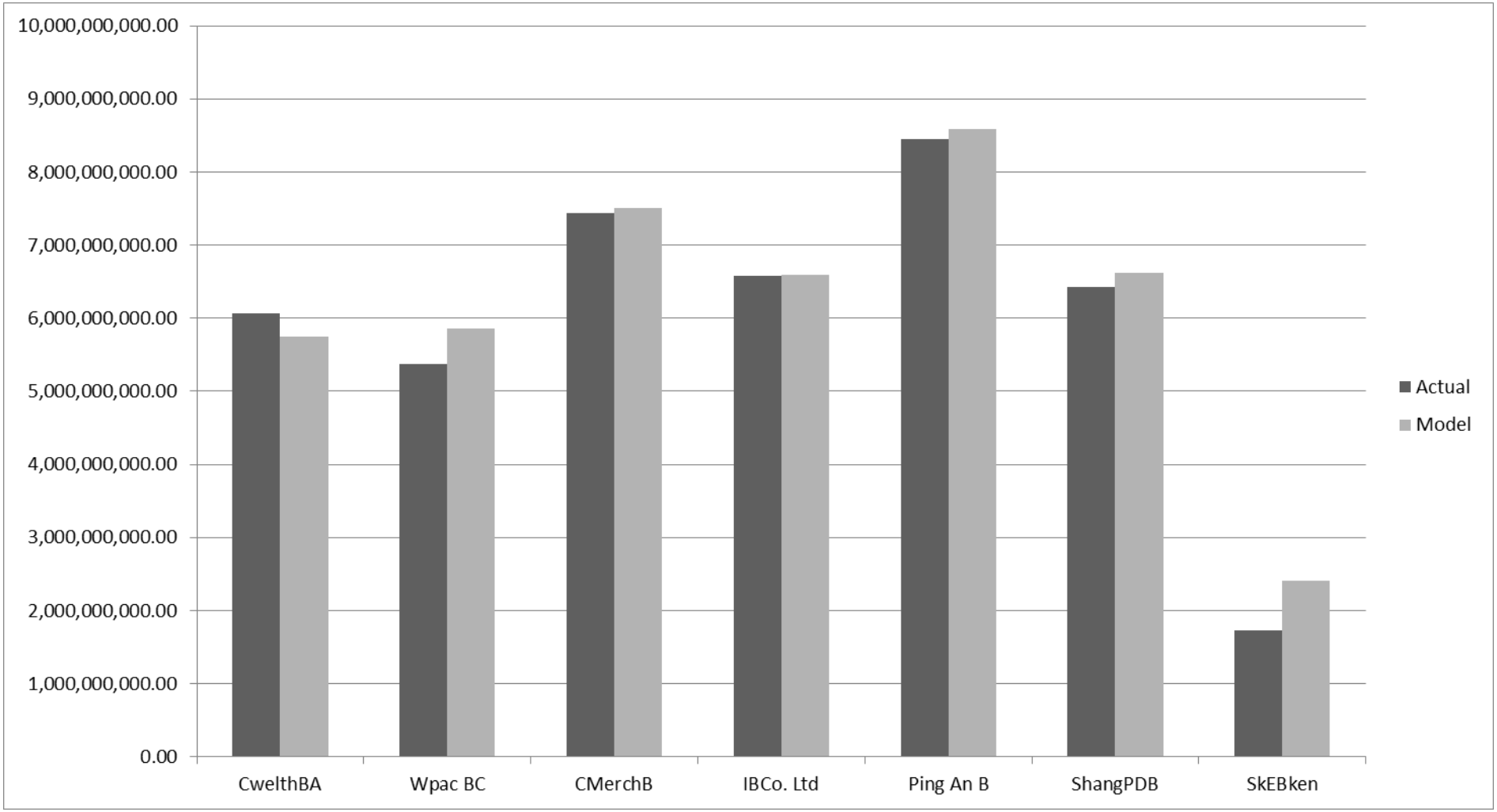
Source: Author

Graph B.6: Profits from FY2015



Source: Author

Graph B.7: Banks with closest profits in FY2015



Source: Author