CORPORATE GOVERNANCE, FINANCIAL DISTRESS, AND RISK-TAKING IN THE USA BANKING SECTOR

by

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The candidate confirms that the work submitted is his own, except where work which has formed part of jointly-authored publication has been included. The contribution of the candidate and the other author to this work has been explicitly indicated overleaf. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

The following thesis section is based on work from co-authored publication.

Thesis Section	**Jointly-Authored Publication**
Distance to default, subordinated debt, and market discipline.	Distance to default, subordinated debt, and financial distress indicators in the banking industry, *Accounting and Finance* 50, (2010) pp. 853-873.

The candidate confirms that he is the principal author of this publication listed above. The work contained in this article arose directly out of the work for this PhD thesis. The candidate undertook the literature review, data collection, and statistical analysis.

In Memory of My Love Ones – Stephania, Mameritha, Ta-Alphonce & Kaabuka

May Almighty God be with them forever and ever Amen!

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Abstract

This thesis investigates the role of corporate governance in US bank holding companies between 1998 to 2007. In the course of the thesis, four main contributions to extant literature are brought to the fore. First, the research facilitates a better understanding of the link between corporate governance and risk-taking. This is the main focus of the thesis and so this strand permeates the entire text. Second, it constructs a distance-to-default indicator, which is used to predict and compare financial conditions in banks that issued subordinated debt with those that did not. Third, it considers the impact of managerial incentives on bank risk-taking through board structure. Finally, the results provide a platform from which to view the various policy implications raised by the thesis.

In analysing the extent to which distance to default is explained by bank risk fundamentals, it is shown that distance to default is predicted marginally better in sub-debt banks relative to non-sub-debt banks. For banks that issue sub-debts, again, it is found that charter values and bank capitalisation further increase the power of bank fundamentals to predict default risk. Turning to bank risk-related variables, capital to assets and non-performing loan ratios negatively and positively affect managerial ownership, respectively. This evidence is new. The percentage of independent directors is positively related to capital to asset and liquid asset ratios, and negatively related to the non-performing loans ratio. Capital to assets and non-performing loan ratios have an observed positive and negative correlation with the percentage of institutional ownership. Also, excessive risk-taking is evident in *ex-ante* and *ex-post* Sarbanes and Regulation and linked to board size. With respect to managerial incentives, equity- and cash-based compensation is positively related to bank risk. Finally, while leverage varies directly with stock options, it is inversely associated with cash compensation.

Table of Contents

List of Tables

List of Appendixes

List of Figures

List of Abbreviations

AMEX	American Stock Exchange
BCBS	Basel Committee on Banking Supervision
BHC	Bank Holding Company
BOPEC	Bank subsidiaries, other nonbank subsidiaries, parent company, earnings, and capital adequacy
BSM	Black-Scholes-Merton structural model of default probabilities
CAMEL	Capital adequacy, Assets quality, Management efficiency, Earnings & Liquidity
DD	Distance to Default
FDIC	Federal Deposit Insurance Corporation
FED	Federal Reserve System
GAAP	Generally Accepted Accounting Principles
GLBA	Gramm-Leach-Bliley Financial Act
M&As	Mergers and Acquisitions
NASDAQ	National Association of Securities Dealers Automated Quotations
NYSE	New York Stock Exchange
OCC	Office of the Comptroller of the Currency
Sarbanes	Sarbanes-Oxley Act of 2002
SEC	Security and Exchange Commission
SIC	Standard Industrial Classification
SND	Subordinated Debt and Debenture
UK	United Kingdom
US	United Stated (of America)

Chapter 1: Introduction

1.1 Introduction

This chapter focuses on the objectives, motivations, contributions and background of the research in this thesis. The main purpose of the thesis is to investigate the issue of corporate governance in US bank holding companies for the period 1998 through 2007[1]. As such, the thesis makes a contribution to better understanding of the connection between the corporate governance of banks and risk-taking. To achieve this, therefore, three empirical chapters are examined. The first compares the predictive power of distance to default to bank balance sheet specific factors in large bank holding companies that issue subordinated debts and those that do not. The second empirical chapter examines the influence of board and ownership governance on bank risk-taking behaviour. The last empirical chapter investigates whether executive incentive compensation influences bank risk. Taken as a whole, this thesis assesses the relevance of bank corporate governance on risk-taking.

The appealing issue in this investigation is the methodological technique – i.e. an option pricing model employed to construct a distance to default metric to measure default risk. To the best of my knowledge, there is no study that has used this contingent claims estimation to contrast the extent of distance to default to predict distress for bank holding companies that issue subordinated notes and debentures compared to banks that do not issue this security. Analogously, Krishnan et al. (2005) used yield spreads to make such a comparison of sub-debt bank holding companies and non-banking firms, and find an absence of market discipline.

The remainder of this chapter is organised as follows. Section 1.2 reports on the motivation of this investigation. Section 1.3 discusses the main contribution of this thesis, while the remaining contributions are described in sub-sections with their respective empirical findings. Section 1.4 discusses the institutional framework. Finally, the structure of the thesis is presented in Section 1.5.

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[1] It is commonly referred to as the United States, the USA, the United States of America, or America. The US was a former British colony until it declared independence on July 4, 1776. It is a federal constitutional republic made up of fifty states and federal districts.

1.2 Motivation of the thesis

In this thesis, bank risk-taking is considered from a corporate governance perspective. Thus, the evident research question is whether corporate governance influences the risk-taking behaviour in banking firms. To respond, the thesis makes use of the academic literature and has gathered inherent stylised facts. The research question is motivated by the following considerations. First, most empirical evidence shows support for the increased usage of market discipline by supervisors to assess risk exposures of banks (Flannery, 1998; Sironi, 2003; Gropp et al., 2006). The market indicators used by regulatory bodies to assess bank risk changes are two - i.e. subordinated debenture yield spreads and distance to default. While the former is the more commonly used market signal of banks financial distress, the latter is quite new.

Generally, the literature supports the theory that sub-debt yield spread and bank balance sheet risk data are closely associated - and thus, mandatory subordinated debts shape risk taking. Indeed, whether distance to default is important to market participants in assessing banks' risk exposure is a still an unanswered question. Campbell et al. (2008) define distance to default as "the difference between the asset value of the firm and the face value of its debt, scaled by the standard deviation of the firm's asset value". The interpretation of this definition is that the higher the number of standard deviations the value of the firms' assets are away from the face value of the outstanding debt reflects greater stability in firm. With this position, a firm is less vulnerable to the risk of default.

Second, much of the academic literature and popular debate about corporate governance has as its focus, industrial firms. Remarkably, very few studies have made a concerted effort to analyse these phenomena in financial firms, and most conclusions are generalised from the industrials' perspective. In fact, the literature confirms the fact that banks have unique features which distinguish them from industrial firms. It should, therefore, be argued that corporate governance forces that work in unregulated firms could affect banks differently. As such, this may help to infer the relevance of corporate governance to shaping risk-taking in banks.

From a theoretical perspective, the principal-agent framework suggests that board, ownership and compensation structure affect risk taking (Jensen and Meckling, 1976; John et al., 2008; Cheng, 2008) in industrial firms. In banks, the following papers exemplify the link between risk and corporate governance: board

structure (i.e., Staikouras et al., 2007; Akhigbe and Martin, 2008; Pathan, 2009), ownership structure (i.e., Saunders et al. 1990; Laeven and Levine, 2009; among others), and executive compensation (i.e., Houston and James, 1995; Chen et al., 2006; DeYoung et al., 2010; Vallascas and Hagendorff, 2010). Laeven and Levine (2009) argued that regulations might have an extreme impact on corporate governance control mechanisms and on bank risk-taking behaviour.

Third, subsequent to the Riegle-Neal of 1994 and the Gramm-Leach-Bliley of 1999 (GLBA) legislations, banking firms, operations and financial services are generally considered as increasingly too complex and opaque. Indeed, these new pieces of legislation significantly changed the opportunity investment sets in the banking sector from the mid 1990s onwards. Given this deregulated banking environment, banks shifted to an "originate-and-securitize" lending model from the traditional "originate-and-hold" lending model (Stiroh, 2006; DeYoung et al., 2010)[2]. Today, this innovation in the financial industry generates banks' substantial non-interest revenues relative to "originate-and hold" lending model. Ultimately, banks found themselves motivated to engage in excessively risky and imprudent bank lending behaviour. As many contend, this conduct, a root cause of bank failures, downward economic spirals and business cycle fluctuations, can increase systematic risk[3]. In turn, this adversely impacts the entire financial system – and society as a whole. According to the Federal Deposit Insurance Corporation report, 472 banks failed between October 13, 2000 and July 6, 2012 (see Figure 1-1). This number is substantially less if compared to the number of 1,617 banks with $302 billion in assets debacle (1980-94)[4]. However, the recent financial crisis (2007/09) had severe impact on the global entire economy in comparison to the past financial crises.

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[2] In originate-and-securitize lending model, banks derive fee income from securities underwriting, insurance underwriting, merchant banking, mortgage-backed securities (MBS)/ asset-backed securities (ABS) and other expanding product lines, while earning assets are major source of interest income in traditional bank lending model.

[3] Systematic risk refers to an incident in which a sizeable number of financial firms default systematically (Lehar, 2005). For instance, the US subprime mortgage crisis that started in June 2007 broadened into the entire financial sector before affecting the national and global financial and economic systems in less than two years.

[4] See Heffernan (2005) and Cebenoyan et al. (1999) for the US bank and thrift crises during the period 1980-1994.

Finally, in the wake of corporate scandals, default risk, business failures, bankers' excessive pay packages, and the current financial market stress, the question of the efficacy of corporate governance has spawned vibrant global discussion. In corporate governance failures, especially, the boards are suspect in corporate scandals and the financial crisis (Adams, 2009; Mehran et al., 2011) and the presence of institutional investors on the boards enhanced banks' risk exposures (Laeven and Levine, 2009). Therefore, to stave off future unprecedented risk and repeated crises (as the financial market crisis of 2007-09 and many others) perhaps public authorities can be prudently expected to safeguard the financial systems. Along with the "last resort" doctrine, on October 3rd 2008, the US House of Representatives approved a $700 billion bail-out package for US financial institutions to reduce the escalation of the sub-prime mortgage risk exposures[5].

Based on the above discussion, researchers, practitioners, and policy makers have placed a focus on bank corporate governance research. Consequently, these arguments make it a central and motivating case for my thesis to conduct research in this topical issue.

1.3 Contribution of the Thesis

This section discusses the contributions to extant academic literature and policy making. The main contribution of the thesis is to improve understanding of the importance of a diversity of corporate governance elements and risk-taking in the financial sector. With this, the thesis considers four elements of corporate governance and their impact on bank risk. As such, it casts doubt on the relevance of corporate governance to bank risk-taking behaviour. The corporate governance forces looked at are the boards, ownership, executive compensation, and market discipline (see Figure 2-1, pp. 19, for synopsis of corporate governance framework). Existing academic research considers the impact of agency control mechanisms on bank risk-taking in isolation - i.e. ownership, board, and compensation structures (i.e., Saunders et al., 1990; Gorton and Rosen, 1995; Anderson and Fraser, 2000; Konishi and Yasada, 2004; Chen et al., 2006; Staikouras et al., 2007; Akhigbe and Martin, 2008; Laeven and Levine, 2009; Pathan, 2009; DeYoung et al., 2010), and market discipline (Flannery and Sorescu,

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[5] See http://www.independent.co.uk/news/world/americas/house-approves-700bn-rescue-plan-950581.html

1996; Flannery, 1998; Martinez-Peria and Schmuckler, 2001; Goyal et al., 2005; Gropp et al., 2006, among others). In the thesis are references to Tables 2-1 to 2-4, which reviews the literature attempting measures of corporate governance on bank risk proxies.

To my knowledge the following evidence is not yet considered for banking firms: The first is a positive association between the percentage of independent directors, and total capital to total assets and liquid asset ratios. There is also the negative link between the percentage of independent directors and non-performing loans ratio. This relationship is also true for large complex banks. Thus, it is suggested that policy reforms should carry more weight in independent directors' decisions in shaping bank risk-taking behaviour. The second is a positive tension between CEO stock options and bank leverage. Finally, there is the comparison of distance to default on bank balance risk measures in banks that issued subordinated debt with those that have not. These new findings, therefore, have policy implications over bank risk-taking activity and corporate governance. The rest of the contributions are discussed in the next sub-sections along with the respective empirical evidence.

1.3.1 Distance to default, subordinated debt, and market discipline

The first empirical investigation relates to the degree to which distance to default can be explained by bank risk fundamentals in sub-debt and non sub-debt banks[6]. One of the major contributions from the results is the contrasting and comparing of the extent of distance to default in predicting bank distress for those banks that issue subordinated notes and debentures with banks that do not issue sub-debts. Existing academic research that analyses the link between distance to default and bank specific risk characteristics, does not make such comparisons. In this regard, my analysis adds to studies by Gropp et al. (2006) and Akhigbe et al. (2007) by highlighting that distance to default is more relevant in sub-debt banks. The second contribution is to examine distance to default on banks with low charter value through high-chartered value banks, as well as low capitalised banks against high capitalised one. By employing charter value (Tobin's Q) and capitalisation ratio ranking portfolios, these results lend credence to the theory that distance to default

[6] In this thesis, "sub-debt" may be used interchangeably with "subordinated debt" to mean bank holding companies that issued subordinated debt.

has higher predictive power in higher charter value and low capitalised sub-debt banks. This evidence is new.

Third, I add to the literature on leading indicators of bank financial distress by evaluating the connection between default likelihood and bank risk fundamentals. Presently, distance to default is considered as one of the leading market-indicators in predicting a bank's financial fragility (Gropp et al. 2004, 2006; Akhigbe et al. 2007). Bank supervisors and policymakers are interested in and have seen distance to default to have higher predicting ability than yield spreads. Thus, as argued by previous researchers, it may be complementary to accounting risk-based data to signal the possibility of bankruptcy. Such analysis allows for some inferences under which market signals may be substitute or complementary to regulatory intervention. Fourth, the investigation contributes to ongoing mandatory market-based policy reform, in which, large BHCs are required to have subordinated notes and debentures in their tier 2 capital.

The main empirical findings are summarised below. Distance to default is slightly predicted by bank-specific risks on sub-debt banks in comparison to banks that had not issued subordinated debt. This association explains some of the existence of market discipline, that is, sub-debt issuance restrains risk-taking in bank holding companies. That is with the theoretical keystone, sub-debt investors priced bank risk-accounting information. Thus, these investors will incorporate any readily available information in banks' risk changes for their future security issues. By so doing, they can constrain greater bank risk-taking tendencies by demanding higher risk premium compensation for any additional default risk on their future debt sales (Martinez-Peria and Schmukler, 2001; Sironi, 2003).

In the quintile of banks with highest charter value (Q5), bank risk fundamentals explain the higher share of the variation in distance to default relative to the quintile of banks with lowest charter value (Q1). The interactions of return on assets and market leverage and reserve loan losses and market leverage are negatively and positively related to distance to default. These associations support the supposition of credit default reduction via efficient management and credit risk in highly leveraged banks, respectively (Flannery and Sorescu, 1996; Sironi, 2003). To avoid losing valuable charters - a self-imposed risk disciplinary control mechanism, banks located in Q5 are disincentivised to take on greater risk activities (Keeley, 1990). As such, asymmetric information in larger publicly traded banks is less likely to reflect the real asset values through the bank risk-fundamentals. The results show that

distance to default sensitivity to bank risk fundamentals is higher in undercapitalised banks relative to those which are well capitalised.

Generally, the empirical evidence presented shows that there is a relationship between balance sheet accounting information and distance to default. This link is important to bank sub-debt investors. In fact, this private monitoring mechanism mitigates excessive bank risk-taking despite the fact that it might be weakened by government protections or bail-outs. More importantly, evidence presented sheds some light over the discussion on policy issues in regard to mandatory sub-debt requirements by large complex banks.

1.3.2 Corporate governance and bank risk-taking behaviour

This second empirical research strand investigates the impact of board and ownership structure on bank risk. The empirical evidence adds to the literature in four ways. First, this thesis is not aware of any investigation that considers the effect of board and ownership structure on bank balance sheet risk and its reflection on capital adequacy, asset quality and liquidity status. The weakening risk information of these indicators is essential from the supervisory and policymakers' perspective. With this appeal, this analysis suggests that board and ownership structure are relevant for risk-taking in banks. For example, while insiders' shareholdings and smaller boards exacerbate agency problems; independent directors are important in shaping excessive bank risk-taking behaviour. In effect, corporate governance of banks ought to be structured in a manner consistent with downsizing managers' incentives to greater risk-taking.

Second, the link between board structure and risk adds to the evidence by examining the effect of boards on bank risk-taking (Staikouras et al., 2007; Akhigbe and Martin, 2008; Pathan, 2009). Third, it advances the existing literature by comparing the balance sheet risk-based sensitivity to board and ownership structure in small and large banks. Consistent with the view for complex firms requiring greater advice by larger boards (Coles et al., 2008) - large banks have larger boards in connection with liquidity risk management advisory needs. Fourth, comparison of bank risk-taking behaviour and board structure ex-ante and ex-post Sarbanes enactment and Regulation A in the 2003 amendment is somehow overlooked. Jorgensen and Kirschenheiter (2003) proffer the theory that firms which practice mandatory risk disclosures have higher market risk. Analysing board

characteristics and risk-taking patterns over the two regimes, it seems that board size is an indispensable characteristic as per Sarbanes enactment.

Finally, the chapter sheds some light on the discussion on policy issues related to bank governance. In particular, the relevance of board independence in formulating bank policies. Given the findings in this empirical chapter, a rethinking and new direction in governance monitoring devices is imperative in banks. By adopting sound bank governance, risk-taking could be kept at an acceptable level.

The evidence presented in this empirical analysis is in line with the hypothesis that corporate governance influence bank-risk-taking. Systematically, the findings indicate a statistically significant negative association between managerial ownership and capital to asset ratio, which, in turn, reduced bank capital levels. Liquid asset ratio varies with managerial ownership and is nonlinear. As predicted, non-performing loans ratio initially decreases before it increases as a function of managerial ownership in nonlinear form. One possible explanation for this is that as managerial shareholdings increase, managers' incentives tend to be more closely aligned to those of shareholders. As such, they are incentivised to pursue risky strategies that enhance the value of shareholders equity call-option.

In addition, while the capital to assets and the liquid asset ratios increase as a function of the percentage of independent directors, the non-performing loans ratio decreases. Evidence suggests that the independent directors may play an important monitoring role in shaping managerial risk-taking behaviour. The findings are consistent with those indicated by Akhigbe and Martin (2008) and Pathan (2009), and Cheng (2008) for industrials. With this position, one may also argue that bank independent directors are complementary to regulation devices in controlling excessive risk-taking. Another positive result relates to the presence of institutional investors. Both total capital to total asset and non-performing loans positively are related to the percentage of institutional investors.

Throughout, board size is negative and statistically significantly related to bank risk - capital to assets, non-performing loans and liquid assets ratios. These results suggest that smaller boards increase bank risk level in capital and liquidity. In this atmosphere, smaller boards may not be good monitors for the owners due to their greater extreme decision making problems. By contrast, smaller board can improve credit portfolio status. Finally, the evidence confirms that in respect to bank risk-

taking, smaller boards remain an explanatory characteristic of board governance ex-ante Sarbanes and ex-post Sarbanes and Regulation A legislations.

1.3.3 Managerial incentives and risk-taking in banking

The last empirical chapter investigates the impact of CEO compensation on bank risk. It documents four main contributions to academic literature. One, it considers the literature on bank risk-taking and executive compensation. The evidence presented adds to the literature that managerial compensation incentives motivate risk-taking in banking institutions. This body of research has been until now narrow and somewhat contradictory (Houston and James, 1995; Angbazo and Narayanan, 1997; Brewer et al., 2003; Chen et al. 2006; Mehran and Rosenberg, 2008; DeYoung et al., 2010; Vallascas and Hagendorff, 2010). In addition, the empirical chapter analyses leverage-observable risk on executive compensation and the findings reveal that managerial compensation incentives encourage managers to pursue an aggressive debt policy. Two, it contributes to banking literature by examining the link between bank risk and executive compensation through the corporate board. The evidence presented shows that both compensation and board structure are determinants of bank risk-taking and debt policy. Because executive compensation and boards are substitutes in managerial alignment and monitoring, however, their simultaneous application could promote excessive bank risk-taking.

Three, it examines numerous theories - they consist, as well as agency, moral hazard, contracting, information asymmetry, and deregulatory environments and their impact on managerial compensation and bank risk. In this theoretical combination, it is suggested that these cornerstones reinforce the principal-agent models for the analysis related to managerial incentives and bank risk-taking. To assess the connection between managerial compensation and risk-taking, prior research mainly focuses on the principal-agent model. Houston and James (1995) evaluate moral hazard and contracting hypotheses and report that compensation does not promote bank risk-taking. Chen et al. (2006) indicate a strong positive association between executive option compensation and risk, which, they contended, was attributable to the information asymmetry hypothesis and not principal-agent model.

Finally, the chapter offers a consideration of policy implications. The culture of excessive bankers' pay and boards' failures are generally accepted to have

triggered excessive risk-taking during the financial crisis. With this fractious dialogue among stakeholders, it is proposed that bankers' compensation structure should be re-designed. Executive compensation contracts, therefore, should now consider firm performance and the risk aspect as well, rather than emphasising maximisation of shareholders' wealth value alone.

This empirical analysis reveals strong support that both bank risk and debt policy vary directly with equity-based compensation. The evidence is consistent with that indicated in Chen et al. (2006), Mehran and Rosenberg (2008), and Vallascas and Hagendorff (2010) and is supportive of risk-aversion models. More specifically, it is indicated that stock ownership and stock option impact positively and are statistically significant in equity return volatility. Leverage varies directly with stock option, indicating how executive compensation structure influences aggressive debt policies. Moreover, while equity return volatility is positively related to cash-based compensation, the latter is inversely associated with leverage. Evidence of a positive association suggests that cash compensation (perhaps bonuses) promotes risk-taking as does equity-based compensation – i.e. stock ownership and stock options.

With respect to board governance, both bank risk and leverage are a decreasing function of board size. The evidence explains that banks with larger boards which are amply rewarded by means of equity-based remuneration are more likely to select riskier investment portfolios and implement aggressive debt policies that are commensurate with neutral shareholders preferences. For control variables, throughout, market to book ratio affects negatively in bank risk and leverage regression, consistent with the moral hazard models. Overall, across all regression models, the natural log of bank size impacts positively in both equity return volatility and leverage. Finally, executive compensation and board structure are jointly determined with bank risk and leverage.

In summary two dominant issues emerge in this thesis. First and most important is the key contribution of the thesis *re* the effect of different corporate governance forces on bank risk-taking. On this point, the thesis analyses the board and ownership, executive compensation, and market discipline governance systems and provides an understanding of their effect on bank risk. Second, it offers potential policy motivations. It is proposed, therefore, that good corporate governance is essential for banks in converging managers' interests with those of shareholders and other recognised multi-constituents. To this end, this thesis is

beneficial and of interest to not only to academics, but also to practitioners and policymakers.

1.4 Institutional Framework

In this section, the thesis discusses the institutional framework within which the research is based. It is worth mentioning that this investigation cannot ignore the institutional framework. Petschnigg (2005) defines the institutional framework as "the organisational entities, procedures and practices of financial regulation and supervision, including issues such as competences and the distribution of powers". Institutional framework is important to readers in interpreting and understanding subsequent chapters relate to the corporate governance of banks. One key finding highlights the point that legal framework (both laws and their enforcement), and regulatory and institutional foundations, are essential aspects in sound corporate governance. This evidence is exemplified by Craig (2004) who contends that some part of Sarbanes-Oxley Act of 2002 provisions (i.e., compensations) had been borrowed from bank governance.

According to Heffernan (2005), the shape and structure of the US banking system is dominated by the world's complex banking firms and many small banks. As of September 2004, the largest 50 banks represent approximately 70 percent of all commercial banks' assets (for example, see Petschnigg, 2005, p. 34, Annex IV). In response to repeated bank collapses, counteractive institutional measures were enacted to ensure the safety and soundness of the US financial system. This institutional framework has been formulated on an anecdotal and situational basis. Petschnigg (2005) also documents that the institutional regime of the US financial system is featured by high institutional density – i.e. with both federal and state regulatory agencies as discussed below.

1.4.1 The main bank regulators

The US financial system includes, in addition to commercial banks, savings and loans and thrifts, stock and bond markets, options and futures exchanges, firm pension schemes, and securities firms. Under a modern economic definition, a bank is a financial institution "that accepts demand deposits and makes loans" (Haubrich and Santos, 2003, p. 124).

The main US banking system federal regulators are four. First, with regard to the Office of the Comptroller of the Currency (OCC) this was established by the National Currency Act of 1863. As a federal supervisor, OCC is responsible for nationally/federally chartered banks. Second is the Federal Reserve System (FED) this was enacted by the Federal Reserve Act (Shull, 1994), subsequent to a banking crisis episode. The Act was signed into law on December 23, 1913 to form a central bank for the US banking system that ended the National Banking Era (Gorton, 1988). FED charters and regulates state banks. The existence of both state and national banks is known as a "dual banking" system.

Third, the Federal Deposit Insurance Corporation (FDIC) was created by the Deposit Insurance Corporation Act of 1933. The FDIC is responsible for chartering state banks that are not within the jurisdiction of FED. The FDIC guarantees public confidence by safeguarding deposits to customers of member banks and FED's member banks to the standard insurance amount (the current caps is $250,000). However, banks have charter and regulatory authority options – i.e. can choose national or state charter (Adams, 2009). Fourth, with regard to the Office of Thrift Supervision this is a successor of Federal Home Loan Bank. It was passed by the Office of Thrift Supervision Act of 1989 to charter and regulate thrifts.

Finally, in respect to the Securities and Exchange Commission (SEC) and Commodity Futures Trading Commission these are responsible for investment banks. The role of the SEC is to ensure the enforcement of the Securities Exchange Act, and to guarantee that investors are protected and well-informed. It also requires the disclosure of securities information and, has enforcement authority over those who violate the securities laws - accounting frauds, provision of misleading information, self-dealing or insider trading[7].

1.4.2 Types of regulation

Regulations in the financial sector are mainly for systematic stability and protection of consumers from monopolistic exploitation. Regulation can be classified into three categories, namely - systematic, prudential and conduct of business. According to

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[7] Shleifer and Vishny (1997) exemplified self-dealing to include executive perks, excessive compensation, transfer pricing, appropriation of corporate opportunities, self-servicing financial transactions-directed equity issuance or personal loans to insider dealers, as well as outright theft of corporate assets.

Goodhart et al. (1998), systematic regulation is public policy intended to ensure the safety and soundness of the financial system through minimising bank runs risk. Examples of these public reforms are deposit insurance, lender-of-last-resort, bail-out waves, or special re-organisation.

A prudential regulation refers to capital adequacy, constraints on large exposure, management capability, earnings ability, and liquidity position. Bank capital requirements and assets are the keystones of supervision and regulation for controlling bank risk-taking. Capital buffers a bank as coinsurance against adverse outcomes associated with huge losses due to default risk. With this, the Basel framework also (Basel Accord I & II) places stress on the association between capital adequacy and portfolio credit risks in regards to risk-weighted assets [Flannery and Rangan, 2008].

Basel II published in 2004, is designed to encourage individual banks to use their internal methods to calculate capital charges, to improve the level of their risk management system and to enhance disclosure and transparency levels through one of its pillars - Pillar 3 (Market Discipline). While assessment of capital adequacy is covered under Pillar 1, reduction of risk exposure or capital charges above the minimum requirement falls under Pillar 2. Overall, sceptics of regulation have argued that regulations are counterproductive and no longer effective in preventing excessive risk-taking and bank failures. They propose corporate governance to complement or substitute for the traditional regulatory monitoring system.

1.4.3 Aspects of corporate governance

The “corporate governance” terminology was first articulated in the 18th century by Adam Smith (1776) [(Jensen and Meckling, 1976)][8]. Vishny and Shleifer (1997) refer to corporate governance as “the ways in which suppliers of finance to corporations assure themselves of getting return on their investment”. From the banking perspective, corporate governance “involves the manner in which the business and affairs of individual institutions are governed by their board of

[8] Denis and McConnel (2005) defined corporate governance as “the set of mechanisms – both institutional and market-based – that induce the self interested controllers of a company (those that make decisions regarding how company will be operated) to make decisions that maximise the value of the company to its owners (the suppliers of the capital).”

directors and senior management, which affects how they set corporate objectives, operate the bank's business on a day-to-day basis, meet the obligation of accountability to their shareholders and take into account the interests of other recognised stakeholders, align corporate activities and behaviour with the exception that banks will operate in a safe and sound manner, and in compliance with applicable laws and regulations, and protect the interest of depositors (Basel Committee on Banking Supervision, 2006, p. 4)".

Indeed, financial firms differ from non-financial firms in a number of aspects. Banks are characterised by greater regulation, opacity in asset composition and different organisational structure (Morgan, 2002; Adams and Mehran, 2003). In addition to these banks' exclusive features, a diversity of stakeholders is interested in the behaviour of banks – i.e. stockholders, debtholders, depositors and regulators. Theoretical foundation upholds that bank insiders could possess important private information about bank loan portfolio risk as well as portfolio management efforts. Greenspan (1996) as quoted by Flannery et al. (2004, p. 420), notes that "bank loans are customised, privately negotiated agreements that, despite increases in availability of price information and in trading activity, still quite often lack transparency and liquidity. This makes the risks of many bank loans rather difficult to quantify and to manage".

Similarly, opacity in banks not only aggravates information asymmetry and agency problems, but also, weakens their corporate governance to a greater degree than occurs in industrial firms (Levine, 2004). Therefore, it is worth noting that the role of banks within the economy is not only to channel financial resources to economic units, but also to be vigorous in the governance of industrial firms (Caprio et al., 2007) – i.e. in German governance model countries. However, the US banks continually implement good corporate governance practices and best practices that are believed to boost performance.

1.4.4 Corporate governance and failures

The importance of corporate governance in the US has been evidenced by accounting scandals and bankruptcies in Enron, Tyco International, Adelphia, Peregrine Systems and WorldCom in the early 2000s. Poor corporate behaviour in firms ranged from conflict of interest, self-dealing, deceptive financial reporting, as well as too-friendly oversight by boards (Craig, 2004). Reacting to the highlighted

instance of corporate explosion events, the Sarbanes Oxley Act of 2002 was passed. This legislation is intended to enhance corporate financial transparency, disclosures behaviour, director independence, and oversight through strengthening corporate governance. For example, Enron was rated as being “investment grade” only a few days before the company defaulted (Bharath and Shumway, 2008). To be investment grade rated, the company would have received a BBB or above score - implying low default-risk and financial strength.

Most recently, an example of a high profile scandal in the banking industry was the collapse of Lehman Brothers motivated by balance sheet manipulation and insufficient disclosure[9]. Surprisingly, Lehman’s was well capitalised before and was refused a bail-out at the time of failure. It may be thus argued that to avoid massive costly bailouts, banks should sometimes be allowed to go to the wall (see Figure 1-1). By contrast, Armitage and Marston (2008, p. 315) contend that “the primary motives for disclosure to the stock market are to promote the company’s reputation for openness and to maintain confidence in the company among shareholders and others”. Ultimately, this explains the greater attraction of investments at better terms for investors. Consistent with Akhigbe and Martin (2006), dataset used in this thesis indicates that many US banks adopted the provisions on Sarbanes-Oxley.

Board of directors: The BCBS (2006) underscores the role of board of directors and top executives’ governance for the safety and soundness of banking institutions. Traditionally, banks’ boards of directors had legal obligations to debt claimants and not to shareholders interest (Macey and O’Hara, 2003). Compared to industrials, the business and affairs of the US banks are controlled by the boards. In their oversight, boards of directors set the bar for the highest standards of ethical and conduct and performance of management. To avoid conflict of interest, these benchmarks also affect directors and employees. That is each member in an individual bank has to comply with all laws and legal requirements. To achieve the highest performance of boards and committees, many banks have in place self-evaluation and orientation/training systems. For highest performance, a board member is required to attend (as a minimum) 75 per cent of the annual total meetings held. Based on this evaluation feedback, boards alleviate any detected deviation to enhance bank’s financial performance status.

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[9] For example, see FT.com Financial Times, March 12 2010-00:41.

Furthermore, banks have board committees, including audit, compensation, risk management, asset quality, corporate and governance and executive. Membership of both board and committees is determined by boards and merit-based - i.e. experience foundation and academic qualifications. As defined by Sarbanes and the self-regulatory organisation (SROs), boards are largely dominated by independent directors. The exchange regulatory authorities/SROs include the National Association of Securities Dealers, the New York Stock Exchange (NYSE), and the American Stock Exchange. In many cases, audit, compensation, and corporate and governance and executive committees are composed of independent directors. The audit committee is responsible for overseeing the corporate audit function. It is chaired by a financial expert. With all these elements in place, the question of whether the board of directors acted in the best interest of bank shareholders and other constituents is a largely answerable question.

Ownership structure: Ownership structure is an important monitoring and controlling mechanism for firm's agency conflicts. Institutional and legal set-up restricts ownership and control by institutional shareholdings (banks and other financial institutions) to own and control equity in industrial firms (Gilson, 1990). Subsequent to ownership restriction, Craig (2004) advances the idea that US firms depend on the capital markets to raise liquidity and on the legal system for monitoring corporate governance. For banks to pursue excessive risk-taking, capital regulations require owners to have a large enough ownership stake with a view to align their incentives with those of insurance firms (Boyd and De Nicoló, 2005). Moreover, the Sarbanes law requires disclosure of transactions involving directors, management and principal shareholders owning more than 10 percent of any class of any equity security excluding exempted security.

Code of ethics: Under Section 406 of the Sarbanes-Oxley Act subscribing public firms are required to have in place codes of conduct for top executive officers, employees and directors. The adoption of these codes provides numerous benefits for a company, such as increased investor confidence, reduced staff turnover, as well as reducing insider abuses (Painter-Morland, 2006). In a banking context, the code of ethics offers a foundation for all associates to demonstrate integrity and high ethical standards in their personal and professional dealings. Associates in banks must maintain the highest standards of good banking practice and behave honestly in the eyes of depositors, shareholders and other stakeholders. The code of ethics is exemplified by Macey and O'Hara (2003) - i.e. bank directors should

take solvency risks explicitly into account when making corporate strategic decisions or else face personal liability for non-compliance.

1.4.5 Global financial crisis (2007/09)

Allen and Gale (2000) advocate that the legal system, political factors and financial crises have all impacted considerably on the historical development of the financial system. In response to the recent global financial shock, numerous remedial measures were put in place. They include bank bailout packages, capping or rescinding generous extravagant bonuses and G20 leaders collectively agreeing on joint strengthening supervision and regulation at the London Summit[10]. These politicians and policymakers contended that an incentive compensation culture in banks escalated greater risk-taking behaviour, and ought to be more closely aligned with long-term performance.

Overall, there are key lessons to be learned by policymakers, politicians and regulators in regard to institutional framework. One, it is time to re-examine the efficacy of the current US institutional setting in managing systematic risk. In effect, long-term and permanent institutional building challenges remain critical. To achieve this, a joint consensus and coordination between the US and other affluent economies is the major aspect. Two, regulatory agencies should constantly keep an eye on legal framework, regulatory and institutional foundations, and bank governance policies to avoid unprecedented events and excessive risk-taking. Finally, to enhance market discipline in the banking industry, the institutional environment reforms need to relax the legal and regulatory protocols that suppress sound corporate governance of banks – i.e. restrictions on hostile takeovers.

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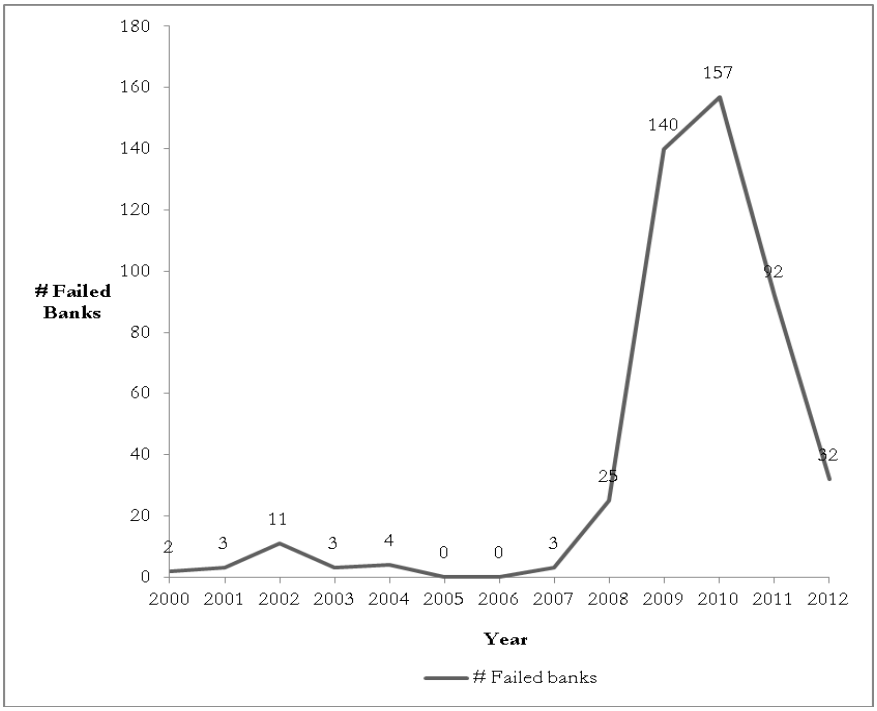
[10] See http://www.londonsummit.gov.uk/en/summit-aims/communique-explanation/ for the real action agreed and other steps to be taken.

Figure 1-1 US Bank Failures: 2000 – 06 July 2012



1.5 The Structure of the Thesis

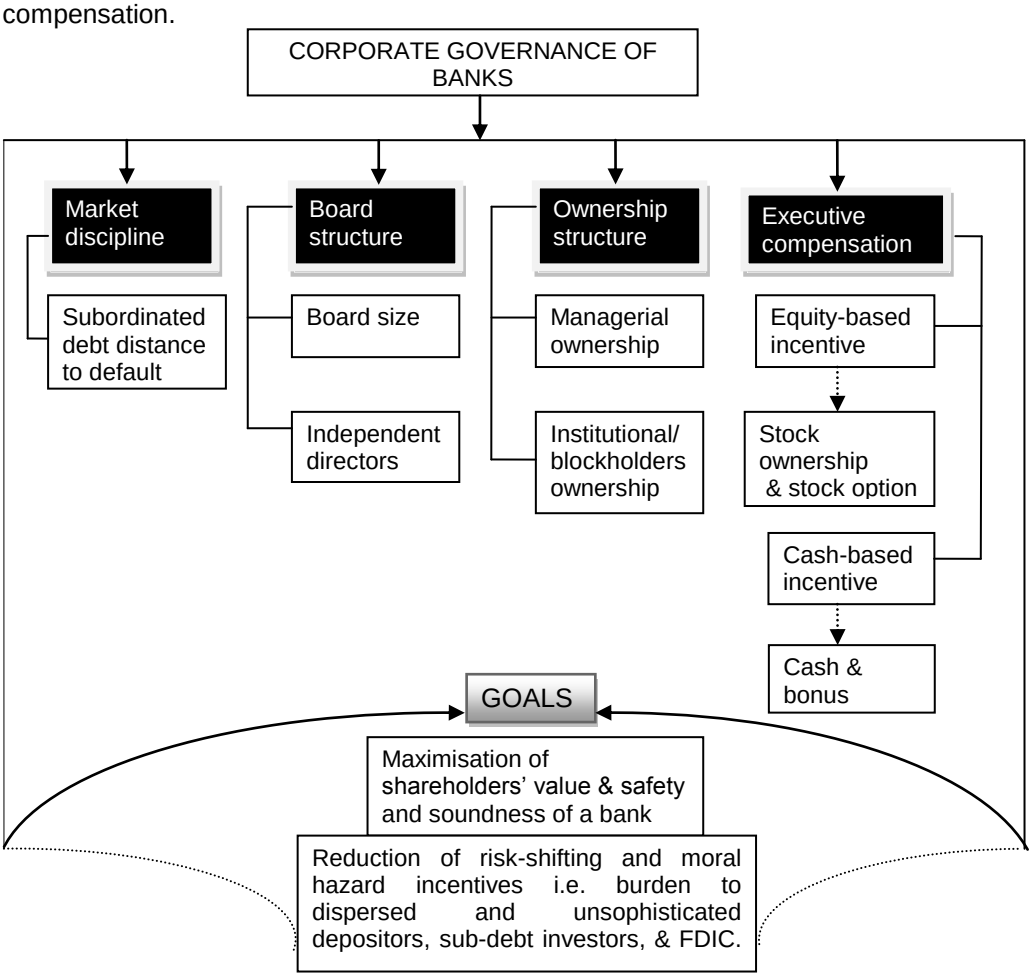
This thesis is organised as follows: Chapter 2 reviews the corporate governance literature of financial institutions. It supplements this with industrial literature. Chapter 3 presents data sources and collection, construction of variables, and analysis of descriptive statistics. Chapter 4 reports and discusses the first empirical study, which deals with distance to default, subordinated debt, and market discipline. This empirical chapter is published in *Accounting and Finance* 50, (2010) pp. 853-870. Chapter 5 reports the second empirical study; bank risk is parameterised as a function of corporate governance – i.e. characteristics of board and ownership to control agency conflicts. Chapter 6 presents the last empirical study; managerial incentives and risk-taking. Chapter 7 closes the thesis by summarising and concluding the main contributions and findings, and proposing implications for new research avenues.

Chapter 2: Literature Review

2.1 Introduction

This chapter surveys literature on financial institution corporate governance. It focuses on four governance aspects: the boards, ownership, executive compensation, and market discipline, as depicted in Figure 2-1. Robust corporate governance has become a priority in banking institutions. With supervisors having "a keen interest in sound corporate governance as it is an essential element in the safe and sound functioning of a bank and may affect the bank's risk profile if not implemented effectively" BCBS (2006, p. 4). Similarly, Caprio et al. (2007) advances that good corporate governance model is important to both industrial and financial institutions.

Figure 2-1 Synopsis of corporate governance framework
This figure presents the summary on four lines of bank corporate governance research. The governance topics investigated are market discipline, boards, ownership, and executive compensation.



Source: Constructed.

The remainder of this chapter is organised into three sets as follows. Section 2.1.1 discusses the nature of agency problems in banks. In general, agency conflicts in banking firms differ from those found in non-financial firms. Section 2.2 discusses a number of mechanisms to mitigate agency problems related to ownership and board structure, managerial compensation, and market discipline. Stylised facts and tables of main findings of empirical studies are summarised at the end of each subsection. The literature suggests that mechanisms to control agency conflicts are essential in shaping executives' opportunistic behaviours. Understanding this literature, thus, helps in formulating hypotheses, forming predictions, providing interpretations, and discussing results. More importantly, it identifies the gaps in the current literature that lead to the original contribution of this thesis. Section 2.3 takes a look at the literature gap and research focus.

2.1.1 The nature of agency problems in the banking industry

Since the pioneering work of Jensen and Meckling (1976), a body of literature has argued that standard agency theory grounds the contractual rights and obligations of managers and shareholders in the modern corporation. Jensen and Meckling's (1976) principal-agent framework represents the agency costs of shareholders[11]. These costs can be divided into two groups – equity and debt agency costs. Jensen and Meckling (ibid, pp. 308) defined an agency relationship as a "contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent". The theory posits that conflicts between managers and owners tend to increase as a result of unobservable managers' actions that involve withholding adverse financial information from shareholders. Hence, why does the corporate governance of bank vary from the company?

The corporate governance of banks differs from that of industrials for a number of reasons. A large number of stakeholders, regulations, high information asymmetry and institutional density (i.e. the institutional system in US),

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[11] By agency costs, Jensen and Meckling (1976) refer to use 'agency costs' to refer to the monitoring expenditures by made by the principal; the bonding expenditures by made by the agent, plus the residual loss incurred due to the costs of enforcing the contracts that fully exceed the benefits. Costs suffered by WorldCom, Enron, Société Générale, Lehman Brothers, AIG,

organisational structure, nature and complexity of financial services, ownership restrictions, anti-takeover activity legislations, less competent qualified and inexperienced directors, larger board size - all these, make governance in banks difficult. (Morgan, 2002; Adams and Mehran, 2003; Becht et al., 2011). However, the board of directors have *de facto* the same fiduciary duty of loyalty and to act in a good-faith in moderating inherent hurdles and to ensure sound governance of banks.

In addition to the standard agency problem, the banking literature also raises the moral hazard problem (Demsetz et al. 1997). Along with Ely (1999, p. 241), this thesis holds that a moral hazard "exists when a decision maker takes risks that he otherwise would not have taken, because the adverse consequences of the risk-taking have been transferred to a third party in a manner that is advantageous to the risk-taker and, more important, is disadvantageous and potentially even destructive to the party to whom the risk has been shifted". There are two sets of relationships within which moral hazards arise in banking. The first occurs between lenders and borrowers, as the lender can benefit from private and superior information production that is used to monitor the borrower. The second can be found in the relationship between banks and deposit insurance firms. The latter moral hazard was highlighted by Merton (1977) in pricing the deposit insurance framework.

Merton (1977) showed that the characteristics of put-options and deposit insurance are identical. Indeed, the fixed deposit insurance premium on depository institutions leads to a put-option that is regarded as a subsidy by bank equity-holders. Eventually, the latter ascertain claims on deposit insurance agencies by holding a put-option of the bank's asset value with exercise price equal to the claims of the depositors. In a moral hazard environment, depositors have no incentives to monitor shareholders and prevent them from pursuing excessive risk-taking. The underlying argument sanctioning this behaviour is that the depositors' have the perception that their wealth portfolios are guaranteed by the government once the bank fails. In the end, limited liability and deposit insurance policies increase the value of shareholders equity call-option and equity put-option, respectively, by increasing the risk of banks' assets or reducing the capital level.

Merrill Lynch, housing finance companies, and the recent financial market crisis are cases worthy of examination in this regard.

Generally, the moral hazard problem of excessive risk-taking by bank shareholders is exacerbated by the convexity of the levered equity payoff caused by limited liability, deposit insurance and other federal bail-out schemes (John et al., 1991). The moral hazard view assumes that shareholders make the lending decisions and can take on risk to maximise the value of the insurance if they so desire. And moral hazard models predict that the wealth of shareholders is an increasing function of their asset risk.

2.2 Corporate Governance Elements

The theoretical postulates of agency literature recognise that the corporate governance system helps to level agency problems between owners and managers. As such, it keeps agency costs down and limits managerial self-serving behaviours that hinder the achievement of shareholder objectives. Two competing hypotheses are offered in the corporate governance literature – the shareholder "convergence of interest" or "corporate control" hypothesis (Jensen and Meckling's, 1976), and the managerial "entrenchment" hypothesis (Stulz, 1988).

The "convergence of interest" hypothesis advocates a positive relationship between managerial ownership and firm performance, implying the maximisation of shareholder value. The managerial "entrenchment" hypothesis, on the other hand, contends that a negative association exists between insider ownership and firm performance (Stulz, 1988)[12]. This occurs because managers' undesirable behaviours are imperfectly controlled by shareholders. When managerial holding levels increase substantially, risk-averse managers may find it worthwhile to engage in risk-mitigating strategies (Smith and Stulz, 1985). According to this corporate hedging theory, such strategies may lead to a decline in risk-increasing, positive net present value projects (i.e., the underinvestment problem). The literature advances the thesis that managers' 'nonhuman wealth' - i.e. undiversified wealth portfolios or personal benefits factors - can lead them to behave

[12] Under Stulz's theoretical prediction model, initially, the value of a firm varies directly with the percentage of managerial shareholdings before declining as managerial shareholdings tend to become more concentrated. Berger et al. (1997) defined entrenchment as "the extent to which managers fail to experience discipline from the full range of corporate governance and control mechanisms, including monitoring by the board, the threat of dismissal or takeover, and stock- or compensation-based performance incentives".

conservatively in directing corporate investment resources (Jensen and Meckling, 1976; John et al., 2008).

In that state, managers will have incentives to reduce the firm's stock return volatility by selecting more safe assets. Accordingly, a negative relationship between managerial ownership and risk is expected. This association explains the dominance of the risk-aversion hypothesis over the risk-taking hypothesis. Generally, agency theory predicts that managerial ownership can generate either a convergence effect or an entrenchment effect on management behaviour in the firm. Based on these stylised facts, positive and negative association proposes the convergence of interest hypothesis and the managerial entrenchment hypothesis, respectively. Thus, a combination of these two hypotheses may produce a nonlinear association between managerial ownership and the risk of a firm. This is also true for firm performance.

2.2.1 Ownership structure

One branch of corporate governance literature looks at the ownership structure and its influence on managerial decisions in industrial firms. Undoubtedly, the corporate governance literature has ranked ownership structure as the top agency control mechanism between owners and managers (Demsetz, 1983). Empirical evidence on ownership structure produces both positive and negative relationships between the levels of managerial holdings and firm value (Morck et al., 1988; McConnell and Servaes, 1990; Hermalin and Weisbach, 1991; Miguel et al., 2004; Davies et al., 2005)[13]. Indeed, it appears intuitive to argue that Jensen and Meckling's (1976) classic convergence of interest theory is not robust owing to the mixed findings. The sample size, methodological approach, distinct time period, and prevailing regulatory regime may have motivated these opposing findings. Nevertheless, research by Morck et al. (1988) and McConnell and Servaes (1990) are silent on the issue of endogeneity whilst other studies shed some light on it. Instinctively, this

[13] The results of Morck et al. (1988) and McConnell and Servaes (1990) differ remarkably. While the entrenchment effect range is 5% to 25% in the former, it is between 0% and 40% to 50% in the latter. Differences in model specifications and sample size should be attributed to variations in findings. Short and Keasey (1999) proxy firm performance with market to book value ratio, and return on shareholders' equity equal to profits attributable to shareholders divided by shareholders' equity reserves, and they find cubic association. Furthermore, their analysis does not control the endogeneity problem, notwithstanding the fact that they recognise "reverse" causality running from managerial ownership to firm performance.

modelling infers that the causalities between ownership structure and corporate value/risk are likely to run in two directions.

A great deal of empirical research has examined the question of whether ownership structure is relevant to traded depository institutions' risk-taking behaviours, and has produced contradicting results (Saunders et al., 1990; Gorton and Rosen, 1995; Cebenoyan et al., 1995; Chen et al., 1998; Mudambi and Nicosia 1998; Anderson and Fraser, 2000; Lee, 2002; Konishi and Yasada, 2004; Laeven and Levine, 2009). Following Saunders and his co-authors' lead, several measures of depository institution's risk-taking are modelled on managerial ownership, controlling for the effects of insider ownership on risk-taking. In a manner consistent with agency theories, the main findings from this strand of research (other than those of Chen et al. [1998]) show that risk is positively related to insider ownership. The main risk measures employed in this body of empirical research are capital market risk (i.e., total risk, idiosyncratic risk, and interest rate risk) and insolvency risk. However, Gorton and Rosen (1995), Cebenoyan et al. (1995) and Laeven and Levine (2009) use bank balance sheet risk measures, with control variables including firm size, bank charter value, leverage, return on equity, and equity market value to book value ratio.

Saunders et al. (1990) highlight that ownership structure and risk-taking are positively related in stockholder-controlled banks, which is consistent with managerial incentives to increase the value of their call and put options. Their findings not only ignore the entrenchment effect that Cebenoyan et al. (1995) and Gorton and Rosen (1995) analyse, but also, utilise small sample and, linear specifications. Cebenoyan et al. (1995) used insolvency risk to proxy risk-taking for thrifts relative to the bank stock market risk measures used by Saunders et al. (1990). They defined insolvency risk as being equal to one if the institution's equity to capital ratio is below the 3 percent regulatory minimum, and zero otherwise. Together, they indicate that managers holding a relatively large percentage of stock ownership engaged in higher risk-taking behaviour within certain specific time-periods: between 1979-1982 (Saunders et al., 1990), in 1988 (Cebenoyan et al., 1995), and between 1987-1990 (Lee, 2002).

The above authors, including Anderson and Fraser (2000), have also pointed out that managerial ownership and capital market risk measures were negatively related between 1992 and 1994. Thus, the above body of research reveals an interesting pattern in the connection between ownership structure and risk-taking in

the financial sectors. It is evident that the changes in the regulatory environment – i.e. the forbearance and leniency regime during 1979-1990, and the tight regulations during the period 1992-1994 – have proved to be driving forces for risk-taking.

Cebenoyan et al. (1995) document that thrift firms with managerial ownership over the 25 percent and 23-28 percent marks engaged in greater risk-taking behaviour during the period of regulatory leniency and low charter value respectively. Specifically, in cross-sectional findings, the coefficients of insider ownership and insider ownership squared enter risk models negatively and positively, respectively. Cebenoyan et al. (1995) also show that institutional investor ownership is negative and significantly associated with insolvency risk. Moreover, they indicate that institutional investor ownership and the equity to assets ratio are both positive and significantly related. Knopf and Teall (1996) consider the effect of institutional shareholdings on risk-taking measures (i.e., equity return variability and real estate to total asset ratio). They demonstrate that these parameters are negatively related in deregulatory and regulatory regimes, and are comparable to those found in Cebenoyan et al. (1995). These findings suggest that institutional investors are less susceptible to greater risk-taking, and they ensure that capital adequacy is in place for a healthy financial system – i.e. one that is consistent with the efficient monitoring hypothesis[14,15].

By contrast, Demsetz et al. (1997), Konishi and Yasada (2004), and Laeven and Levine (2009) have documented that institutional investors promote risk-taking in banks. While Demsetz et al. (1997) indicate that the capital to asset ratio varies negatively with large blockholdings, Laeven and Levine (2009) report a negative association between the activity restrictions index and the z-score (a measure of

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[14] To shore up the efficient-monitoring hypothesis, McConnell and Servaes (1990) document a strong association between q and the fraction of institutional investor holdings. Cornett et al. (2007) also report relationship between the percentage of institutional stock ownership and operating cash flow returns in pressure-insensitive institutional investors. These two papers are supportive of the hypothesis that corporate monitoring by the institutional investor could lead to managers paying more attention to corporate performance rather than self-serving behaviour. Cornett et al. (2007) contend that due to corporate governance failures (i.e., the malfunctioning of boards), institutional investors are increasing pressure on managers to align the interests of shareholders.

[15] Smith (1996) and Carleton et al. (1998) demonstrate that shareholder activism by institutional investors (i.e., via insurance firms, pension or mutual funds vehicles) is largely successful in the changing governance structure, leading to the maximization of shareholder wealth. Examples of activist institutions in governance movements include the largest pension funds – i.e., California Public Employees' Retirement System (CalPERS) and the Teachers' Insurance and Annuity Association College Retirement Equities Fund (TIAA-CREF).

bank risk) when a large shareholder is a board member. In contrast, in Japanese banks, Konishi and Yasuda (2004) show that initially, market risk measures decrease proportionally with the impact of stable shareholders, a trend that reversed to positive as the asset substitution effect dominates the effect of managerial entrenchment for greater risk-taking[16]. The "prudent-man" hypothesis postulates that institutional investors that are large blockholders are characterised by greater expertise, opportunity, resources and higher monitoring incentives, with less information asymmetries relative to other shareholders. Thus, the link between institutional ownership and risk has been contradictory, and remains an empirical question.

Lee (2002) provides evidence that greater risk-taking behaviours are prevalent for stockholder-controlled banks relative to managerially controlled ones – i.e. ones with larger asset sizes, lower stock return volatilities and lower capital to asset ratios. This is also consistent with the findings of Saunders et al. (1990). At low charter value banks, Demsetz et al. (1997) have found that ownership structure and risk (total risk and specific risk) are positively related in a piecewise specification when insider holdings are 0 to 5 percent. The negative value that occurs when insider holdings are 5 to 25 percent implies the entrenchment effect in the latter association (see, for instance, Morck et al. (1988) for similar findings). Moreover, Gorton and Rosen (1995), Cebenoyan et al. (1995), and Chen et al. (1998) consider insider ownership on risk-taking to have a nonlinear form, and have all found that managerial ownership and risk-taking are negatively related when managers are entrenched, which is consistent with the risk-aversion hypothesis. Their findings are also inconsistent with those of Saunders et al. (1990) and Lee (2002).

While Chen et al. (1998) employ both linear and nonlinear variation in the logarithmic forms of the percentage of the depository owned by the officers and directors, Gorton and Rosen (1995) use insider ownership value squared in their model's specifications. In both models' specifications, Chen et al. (1998) show the negative relationship between risk and ownership structure, which is unexpected, but consistent with the risk-aversion view of Smith and Stulz (1985). Gorton and Rosen (1995) indicate that insider ownership and insider ownership squared are

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[16] Stable shareholders can be defined as institutional investors holding stocks for long term horizon and they are likely to monitors managers.

significant, positive and negative, respectively, when the non-performing loans ratio is regressed against them – i.e. an inverted U-shaped relation. This function is comparable to that reported by Morck et al. (1988). Gorton and Rosen (1995) also report that insider ownership and insider ownership squared enters negatively and positively in the equity to assets ratio. Moreover, the non-performing loans and return on asset ratios are both positively related to outside blockholders. Thus, they contend that their results are in line with the managerial entrenchment hypothesis rather than moral hazard hypothesis. And they argued that bad managers take excessive risks when the banking industry is unhealthy.

Brewer and Saidenberg (1996) document a U-shaped link between insider holdings and risk-taking in S&Ls, and their findings support both the moral hazard and managerial entrenchment hypotheses, as well as being partially consistent with those in Gorton and Rosen (1995). In contrast to the previously discussed papers, Brewer and Saidenberg (1996) use the volatility of daily equity returns to the standard deviation of asset returns rather than the balance sheet risk measures.

Along with Gorton and Rosen (1995), other studies analyse risk-taking in relation to some of the bank's balance sheet-specific risk information. Knopf and Teall (1996) document a correlation between insider shareholding and risk *ex-ante* the regulatory stringency in thrift institutions. In particular, risk measures (log hi-low stock price ratios, including balance sheet proxies for risk-brokered deposits to total assets, and real estate to total assets ratios) are positively associated with insider shareholding. The equity to total assets ratio is negatively related to insider shareholding. Following ex-post tight regulation through the Financial Institutions Reform, Recovery, and Enforcement Act of 1989, these measures carry the expected predictions (i.e., negative signs) except in relation to the equity to total assets ratio (i.e. predicted positively). The authors argue that banking risks could have adversely impaired a bank's capital position before the regulatory pressure era and can explain the continual negative coefficient sign for the equity to total assets ratio.

Sullivan and Spong (1998), show that bank credit risk measures are determined, to varying extents, by ownership and diversification wealth (manager's bank investment to personal net worth). Specifically, net loan losses to total loans and hired-manager ownership are positively associated. Hired-manager ownership is negatively related to other real estate to total assets and equity to total asset ratios. Variability in net earnings is positively associated with hired-manager ownership.

Hired-manager ownership also enters the survival likelihood index regression negatively and is statistically significant. It should also be noted that the above studies differ in terms of the angles they take. Whilst Sullivan and Spong (1998) do not impose a nonlinear model, Gorton and Rosen, (1995) and Knopf and Teall (1996) consider it to analyse the entrenchment effect. Sullivan and Spong (1998) also analyse manager's diversification, which is not examined by the other researchers.

Further empirical evidence for ownership structure comes from international analysis. Laeven and Levine (2009) find that cash flows (CFs) and z-score regression are negative, statistically significant and related. This is consistent with the findings of Cebenoyan et al. (1995) and Sullivan and Spong (1998), implying that greater bank risk-taking is associated with substantial cash-flow rights of large shareholders[17]. A higher z-score suggests that the default probability risk is remote. Furthermore, Laeven and Levine (2009) indicate that CF enters volatilities in equity and earnings regressions positively, and is statistically significant, as Saunders et al. (1990), Lee (2002), and others have also found. The seminal article by Laeven and Levine (2009) differs markedly from the work of others. Firstly, in a cross-sectional analysis, they show that there is a negative relationship between the interaction term cash-flow and the capital stringency index. Second, they constructed an alternative primary proxy for risk in order to capture insolvency and z-score and use large international bank sample.

In contrast to the research discussed above, some studies have examined the convergence of interest and the entrenchment hypotheses from the performance perspective. This empirical study examines the bank performance and corporate-control relation. Earlier, Glassman and Rhoades' (1980) made a comparison between shareholder-controlled and manager-controlled banks in relation to bank performance (cost efficiency, growth and profit). They found that shareholder-controlled banks exhibit higher profitability than manager-controlled banks (compare to Saunders et al., 1990; Cebenoyan et al., 1995; Lee, 2002 for the managerial risk-hypothesis). Glassman and Rhoades (1980) also report that in banks that have five percent or above shareholder ownership, profit rate is positive and statistically significant. This supports the hypothesis that good performance is linked with a higher degree of owner corporate control, and Glassman and

Rhoades (ibid.) further indicate that there is a nonlinear correlation between bank performance and the extent of owner control, thus supporting the entrenchment effect.

Finally, they report that cost efficiency measures are negatively related to insider-ownership. However, Glassman and Rhoades' (1980) findings here differ from those of Pi and Timme (1993). The latter show that bank performance (cost efficiency and return of assets) is unrelated to ownership structure – institutional and large blockholders ownership. In their most recent work, Elyasiani and Jia (2008) show that BHC performance and institutional ownership stability are positively related, suggesting that institutional investors have incentives to monitor banks with a view to mitigate agency conflicts[18]. Using a simultaneous equations framework, Schranz (1993) analyses the impact of takeover activity restrictions through examining the influence of the concentration of equity ownership and management ownership on bank performance. She finds that banks located in takeover markets are more profitable than those that are not and, in particular, that bank' profit margins are significant and positively related to the concentration of equity and management ownership of their stock.

In the UK financial industry, Mudambi and Nicosia (1998) provide additional support for the convergence of interest hypothesis and the managerial entrenchment hypothesis. They show that the relationship between director ownership and firm performance is non-monotonic. Their work bears similarities to that of Morck et al. (1988), in that they proxy managerial ownership according to the level of equity ownership by the board of directors. Moreover, both sets of authors find the convergence effect occurring in the range of 0 to 5 percent, and 25 percent of managerial ownership afterwards, and that the entrenchment effect range is between 5 percent and 25 percent of managerial ownership. Exceptionally, Mudambi and Nicosia (1998) use return on the stock market to measure firm performance, while Tobin's Q and balance sheet risk are utilised in Morck et al. (1988) and Gorton and Rosen (1995), respectively.

In the past decade, Fogelberg and Griffith (2000) and Griffith et al. (2002) investigated the same question, and found a nonlinear relationship between bank

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[17] Cebenoyan et al. (1995) and Sullivan and Spong (1998) use insider shareholdings instead of cash flow rights to measure stockholder control of lending institutions.

performance and ownership, consistent with the results of Glassman and Rhoades (1980). Compared to other studies, these papers employ economic proxies – i.e. market value added and economic value added – for measuring bank performance. Fogelberg and Griffith (2000) and Griffith et al. (2002) observe that management entrenchment may offset the convergence of interest hypothesis in the banking sector because increased owner control does not necessarily increase the value of the bank.

Sometimes, managers may give less attention to shareholder wealth maximisation or be constrained by regulations to align their interests with those of shareholders. Recently, Caprio et al. (2007) have found that large cash flow rights held by controlling shareholders are associated with high bank valuations, and they suggest that ownership structure has relevance on the governance of industrial firms as well as the banking business.

DeYoung et al. (2001) analyse the effect of managerial shareholdings on performance (profit efficiency) at small, closely held commercial banks that hire outside managers. In general, their findings are supportive of the conceptual model of manager entrenchment, predicting an inverse U-shaped connection between firm performance and hired manager ownership. In particular, they show how entrenchment behaviour peaks when shareholdings are greater than 17 percent. They argue that when managerial shareholdings are under-utilised, hired managers have less incentive to pursue risk-taking, which does not maximise the corporate value for shareholders. Conversely, over-utilisation of managerial shareholdings leads to hired managers being entrenched.

A. Summary

Most of the findings above suggest that a predominance of managerial ownership translates into greater bank risk-taking and increased performance, as predicted by the theory. This camp of empirical evidence thus indicates that both risk and performance are positively related to managerial ownership. Although there is also some evidence of a negative association between managerial ownership and risk (Chen et al., 1998), consistent with the risk-aversion hypothesis, this evidence may

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[18] Hartzell and Starks (2003) found that institutional investors' preferences affect managerial compensation structures, firm performance and risk-taking.

be accounted for by the managerial entrenchment effect. It is evident that stockholder-controlled banks have more incentive to pursue risky activities than managerial-controlled banks during a period of greater deregulation and regulatory forbearance on bank closures.

Table 2-1 Summary of ownership structure for financial institutions

This reports a summary of research into ownership structure. Unless otherwise stated, all studies in this table refer to ownership structure.

Explanatory variable		Sample characteristics		Measure of risk	Sign	Measure of performance	Sign
	Author(s)	Data period	Institutions Number				
Insider ownership	Saunders et al. (1990)	'78-'85	38 BHCs	Equity volatility	Positive		
				Two unsystematic risk proxies from the two-index model with short- and long-term interest rates as the second factor	Positive		
	Cebenoyan et al. (1995)	'88-'91	275 thrifts	Insolvency probability	Positive/negative nonlinear.		
				Equity to asset ratio	No association		
				Repossessed assets to total assets ratio	Positive		
				Sheshunoff performance ranking	Positive		
	Gorton and Rosen (1995)	'84-'90	458 BHCs	Non-performing loans ratio	Positive/negative and nonlinear		
				Equity to asset ratio	Negative/Positive and nonlinear relationship		
						ROA	No association
	Brewer and Saidenberg (1996)	'85:1-'89:4	100 thrifts	Equity volatility	Negative and positive nonlinear		
	Knopf and Teall (1996)	'86-'88	466 thrifts	Log hi-lo stock price ratio	Positive		
		'86-'92		Real estate to total assets/ brokered CDs relative to total assets and insolvency probability	Positive		
		'90-'92		Log hi-lo stock price ratio	Negative		
		'86-'92		Equity to asset ratio	Negative		
	Demsetz et al. (1997)	'91-'95	400 BHCs	Equity volatility	Positive and nonlinear relationship		

				Systematic risk and unsystematic measures	Positive and nonlinear relationship
	Chen et al. (1998)	‘88-‘93	302 thrifts	Capital market risk measures	Negative and nonlinear
	Sullivan and Spong (1998)	’90-‘94	1421 banks	z-score, equity to asset ratio, real estate to total asset ratio & net loans losses to total loans	Negative
	Anderson and Fraser (2000)	‘87-‘89	150 banks	Equity volatility and specific risk	Positive
		‘92-‘94		Equity volatility and specific risk	Negative
		‘87-’89 & ‘92-‘94		Systematic risk	Unrelated
	Lee (2002)	‘87-‘96	65 BHCs	Equity volatility	Positive
				Loan to asset and commercial loan to investment securities	Positive
				Systematic market and interest rate risk	Negative/positive and nonlinear
Cash flows rights	Laeven and Levine (2009)	‘96-‘01	279 banks*	z-score	Negative
				Equity volatility	Positive
				Earnings volatility	Positive
Institutional ownership	Cebenoyan et al. (1995)	‘88-‘91	275 thrifts	Insolvency probability	Negative
				Equity to asset ratio	Positive
				Repossessed assets to total assets	Negative
				Sheshunoff performance ranking	No association
	Knopf and Teall (1996)	‘90-‘92	466 thrifts	Log hi-lo stock price ratio	Negative
		‘86-‘92		Real estate to total assets	Negative
		‘86-‘92		Equity to asset and brokered CDs relative to total assets ratios	Positive

Institutional ownership stability	Konishi and Yasuda (2004)	'90-'99	48 Japanes banks	Total and specific risk	Negative/positive and nonlinear		
	Demsetz et al. (1997)	'91-'95	400 HBCs	Capital to asset ratio	Negative		
Outside blockholders	Gorton and Rosen (1995)	'84-'90	458 BHCs	Non-performing loans ratio	Positive		
				Equity to asset ratio	No association		
						ROAs	Negative
Ownership concentration	Glassman and Rhoades (1980)	'75-'76	1,406 banks			Profit rate & bank growth	Positive
						Cost efficiency	Negative
Insider ownership	Pi and Timme (1993)	'88-'90	112 banks			Return on assets & cost efficiency	Positive
	Schranz (1993)	'79-'87	197 banks			Profit margin	Positive
	Cole and Mehran (1998)	'83-'87	94 thrifts			Mean adjusted stock return	Positive
	Mudambi and Nicosia (1998)	'92-'92	111 UK financial firms			%capital appreciation plus the dividend yield	Negative and nonlinear relationship
	Fogelberg and Griffith (2000)	'96	100 BHCs			Economic value added	curvilinear association
	DeYoung et al. (2001)		266 small banks			Profit efficiency	Positive/negative and nonlinear
Cash flows rights	Caprio et al. (2007)	'00-'01	244 banks*			Tobin's Q	Positive
Institutional ownership	Elyasiani and Jia (2008)	'92-'04	110 BHCs			ROA, Tobin's Q, and EBIT to total assets	Positive

*International sample used in the analysis. ROA refers to return on assets ratio.

2.2.2 Board structure

In addition to ownership structure, the corporate governance literature has also investigated the relevance of board structure in representing shareholders' interests. From the perspective of agency theory, the board of directors – as the apex of the internal control system – is responsible for monitoring, advising, hiring, firing and compensating top executive officers (Jensen, 1993). By contrast, theoretical papers categorise primary activities of the board structure governance as comprising monitoring and advising roles for the maximisation of shareholder value. (Hermalin and Weisbach, 1998; Raheja, 2005; Adams and Ferreira, 2007; Harris and Raviv, 2008). Board structure is also central to the Sarbanes legislation that came about as the result of corporate scandals and failures – i.e. the bankruptcy of Enron. The Sarbanes legislation is designed to enhance and strengthen corporate governance and improve disclosures on finances, and the importance of board independence is emphasised by Sarbanes governance model as well as in the provisions of NYSE and Nasdaq.

From the banking industry's perspective, the Basel Committee on Banking Supervision's consultative document (2006) on enhancing corporate governance for bank firms refers to the role and composition of boards. This document and pillar 2 of the supervisory review process identify the role of board of directors with regard to regulatory reforms and their central part in risk management in banking, respectively. However, Hermalin and Weisbach (2003) and Linck et al. (2008), among others, have pointed out that there is still no formal general economic theory of board structure. Because of the absence of such conceptual support, existing empirical studies appeal to agency theory instead, which suggests that boards should represent shareholders' aspirations – i.e. they should maximise corporate value. Jensen (1993) highlights three board relevant monitoring characteristics – board size, board independence and board leadership – and, owing to this, the selection of board features is based on extant theoretical studies.

One body of literature looks at the link between board size and industrial firm performance, and its results have varied considerably. Board size and firm performance are negatively related, suggesting that larger boards decrease corporate value (Yermack, 1996; Eisenberg et al., 1998; Bhagat and Black, 2002; Hermalin and Weisbach, 2003). This research supports Jensen's (1993) thesis that larger boards are susceptible to greater agency problems than smaller ones. The

inherent agency risks of larger boards range from a lack of coordination and communication, extremism in group decision-making, formulating and agreeing on corporate strategies to director free-riding. Nevertheless, large boards are perceived to be more observant monitors and better advisors (Dalton et al., 1999). On the contrary, Mak and Li (2001) and Beiner et al. (2006) indicate a positive correlation between firm performance and board size. This positive association seems unlikely, and opposes the popular host views supporting small boards. Coles et al. (2008) show that the association between q and board size is U-shaped, and is positive in complex diversified firms because of the larger boards' advisory expertise and responsibilities to the CEO and top executive officers. The U-shaped relationship suggests the possibility of board entrenchment, and, the positive association in complex firms is driven by dominance from outside the board.

Additional studies examine the role of independent directors and firm performance, and reveal conflicting predictions. Yermack (1996), Agrawal and Knoeber (1996), Bhagat and Black (2002) and Coles et al. (2008) indicate that these parameters are negatively associated. In fact, their results do not support the view that outside representation on boards leads to improvement through efficient monitoring[19]. In contrast, other studies have found board independence and performance to be unrelated[20]. There are three plausible explanations for these different results. Firstly, Harris and Raviv (2008) have argued that exogenous factors (i.e., the importance of information of other parties, profit potential, and the opportunity cost of outside directors) can produce negative, positive or no relations between firm performance and, board size, and outside directors. Secondly, smaller boards and insider director-dominated boards centre on their effectiveness in monitoring firms with hard project evaluations (Raheja, 2005). That is, the likelihood of quick decision-making, superior information accessibility and industry-specific knowledge is higher in firms with smaller and more insider-dominated boards, leading to more efficient investment opportunity decisions.

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[19] Yermack (1996) indicates a positive association between the fraction of independent directors and corporate value in fixed-effect regression, and Coles et al. (2008) report a negative relationship in high R&D firms.

[20] Exceptions include Hermalin and Weisbach (1991), Mehran (1995), Mak and Li (2001), and Beiner et al. (2006).

Besides monitoring corporate behaviour, outside directors also play a vital agency role for shareholders' interests. Rosenstein and Wytt (1990) highlight the fact that the appointment of outside directors and excess returns are positive and statistically associated, and that this is consistent with the interests of shareholders. Finally, the lack of a significant association between board independence and performance does not imply that board structure is irrelevant in reducing agency conflicts. According to Coles et al. (2008), the need for an adequate number of independent directors was emphasised by pioneers of corporate governance reforms after the corporate scandals. The guidelines for sound governance are laid out by TIAA-CREF, CaLPERS, Sarbanes, NYE and Nasdaq.

The banking literature on the efficacy of board structure on bank performance is mixed (Adams and Mehran, 2005; Sierra et al., 2006; Akhigbe and Martin, 2006; Staikouras et al., 2007; Andres and Vallelado, 2008). Adams and Mehran (2005) and Andres and Vallelado (2008) connect performance and board size. While Adams and Mehran (2005) report bank performance (measured by Tobin's Q) to be positively related to board size, Andres and Vallelado (2008) indicate both an inverted U-shaped relation and positive associations between the pattern. The findings in these two papers compare with those reported in industrial firms by Mak and Li (2001), Beiner et al., (2006), and Coles et al. (2008). However, Adams and Mehran (2005) argued that a larger board is not value-decreasing in BHCs, which poses an important empirical question about the strength of small boards. The positive relationship between board size and bank performance is contrary to popular views supporting small boards. Three factors have a bearing on the board structure of US banks – i.e. M&As waves, complex organisational forms, and bank loan relationships. In contrast, Andres and Vallelado (2008) argue that their results hold when institutional and regulatory framework, ownership structures, and the weight of the banking system have been controlled for.

Consistent with Coles et al. (2008), Andres and Vallelado (2008) also indicate an inverted U-shaped relationship between the percentage of outside directors and bank performance. In a nonlinear model, Andres and Vallelado (ibid) again show that nineteen directors represent better number for monitoring and advising roles. In contrast, Sierra et al. (2006) and Akhigbe and Martin (2006) have constructed board-monitoring indexes for banks. They report that a higher index score (representing stronger boards) is positive and significantly related to bank performance (proxied by ROA and average abnormal return). Additionally, Akhigbe

and Martin (2006) find that there is a positive association between the degree of board independence and average abnormal return.

Employing a similar methodological approach, Staikouras et al. (2007) and Pathan et al. (2007) investigate the impact of board structure on European and Thai banks' performance (ROA, ROE and q), respectively. These researchers indicate an inverse relationship between bank performance and board size. Their results are consistent with the literature that analyses this link (for example, see Yermack, 1996; Eisenberg et al., 1998 for industrials), and inconsistent with Adams and Mehran (2005) and Andres and Vallelado (2008). To further analyse the effect of the board structure on bank-characteristic variables, Staikouras et al. (2007) show that board size enters risk models – loans to total assets and equity to total assets – negatively when bank size is not controlled in the models. While this paper partially focuses on bank asset quality and capital adequacy risk measures, the issue of liquidity risk is given far less attention.

Existing empirical studies of the association between board composition and bank performance are inconclusive. Pi and Timme (1993) show that bank performance (measured by cost efficiency and ROA) is unrelated to whether directors are insiders or outsiders. Adams and Mehran (2005), Akhigbe and Martin (2006), and Staikouras et al. (2007) fail to establish any systematic connection between board independence and its impact on bank performance, notwithstanding the fact that prior research explicates significant tensions[21]. However, the failure to find an association between the two parameters does not conclude that inside or outside board representation is unimportant in adding firm-specific information or value, respectively. In contrast to the above researchers, under a panel fixed-effect modelling approach, Pathan et al. (2007) find that there is a strong and positive connection between independent directors and bank performance.

Another strand of corporate governance literature analyses the relationship between board structure and risk-taking. Research on this topic is almost non-existent, but recent research undertaken by Cheng (2008) on corporate firms indicates that board size and corporate performance variability are negatively associated. He measured risk through variability in monthly stock returns, ROA, and Tobin's Q, and noted that larger boards have a lower variability in corporate

[21] See for example, Rosenstein and Wytt (1990) and Yermack (1996) for research in this area relating to industrial firms.

performance. He also reports that Tobin's Q residuals decline in the percentage of independent directors. This ground-breaking study offers invaluable insights into board size and risk. In contrast, Horiuchi and Shimizu (2001) indicate that the presence of amakudari officers on the boards of Japanese banks is positively and negatively related to non-performing loans to asset and capital to asset ratios, respectively[22]. They note that amakudari is a "practice of officials retiring from government to accept a new positions in the Japanese private sector". They concluded that this representation in boards increased risk-taking in Japanese banks. However, Konishi and Yasuda (2004) found no impact from amakudari participation in bank boards.

Pathan (2009) assesses the importance of board governance along with risk-taking in banking institutions, and reports that risk is negative and statistically significantly associated with board size. He also shows that bank risk-taking (capital market risks and distance to default measures) is negative and statistically significantly associated with board size. This is consistent with the finding of Cheng (2008). As expected, Akhigbe and Martin (2008) and Pathan (2009) demonstrate that board independence and bank risk are negatively related. This relationship can be partly explained by the role of the board of directors in banks, which covers not only shareholders interests, but also extends to other stakeholders including regulators and depositors. Indeed, directors are owed a fiduciary duty of loyalty and to act in a good-faith in making decisions for their shareholders (Macey and O'Hara, 2003). By contrast, Staikouras et al. (2007) indicates a strong positive relationship between board independence and loans to total assets. While Akhigbe and Martin's (2008) results are based on capital market risk measures, Staikouras et al.'s (2007 employ bank risk-related variables.

With regard to the power of the CEO, literature has argued that the separation of powers between the CEO and the chairman of the board mitigates rather than accentuates agency costs and enhances performance[23]. For instance, a board becomes more independent as the CEO-Chair positions are split (Jensen, 1993). Agency theory can predict a negative or positive effective power of firm performance variability (risk) on a CEO's power (Adams et al., 2005). In large

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[22] Konishi and Yasada (2004) defined amakudari as senior pensioners in Ministry of Finance and Bank of Japan appointed to banks' boards.

[23] Linck et al. (2008) concluded that these dual positions occur in large firms, and are held by older CEOs who have been in their positions for a long period of time.

boards, agency problems seem to be higher, as entrenched CEOs are able to influence and control board decisions, leading to impairments of firm performance (Jensen, 1993). One study reports that the CEO's power and firm performance variability (i.e., in stock returns, ROA and Tobin's Q) are positively related (Adams et al., 2005). In particular, CEO=founder indicator. This finding supports the view that a less risk-averse CEO with substantial stock holdings has incentives to pursue more high-risk activities. Cheng (2008) does not find any association between CEO power and risk.

In banking firms, risk is negatively correlated with the CEO's power (Pathan, 2009), and CEO duality decreases the likelihood of financial distress (Simpson and Gleason, 1999). These authors' findings explain risk-aversion behaviour exhibited by the CEO. In addition, they support the perception that a powerful CEO has incentives to pursue personal interests over shareholders' goals of directing corporate investments. There are three main differences between Pathan's (2009) and Simpson and Gleason's (1999) approaches, however. Firstly, in the former, powerful CEOs are given a dummy variable equal to one when the CEO is both the chair and is internally-hired, and as zero otherwise, whilst in the latter the CEO dummy variable is equal to one when the CEO is the chair. Second, while Pathan (2009) included CEO ownership in his model specification to control the effect of CEO's incentives in risk-taking behaviour, Simpson and Gleason (1999) tested it, and were unable to reject the null hypothesis because of lack of relationship. Finally, bank risk proxies are used in quite different ways. Fogelberg and Griffith (2000) and Griffith et al. (2002) indicate that CEO duality and bank performance (ROA) are unrelated, and negatively correlated in Pi and Timme (1993).

B. Summary

The theoretical keystones and the empirical evidence in the board structure literature suggest that small boards (Yermack, 1996) and more independent directors (Jensen, 1993) are better. However, in this literature, board structure's impact on bank performance is considerably varied. Firstly, there is evidence that supports the thesis that tension between board size and bank performance is positively related (Adams and Mehran, 2005; Andres and Vallelado, 2008), and negatively associated (Staikouras et al., 2007; Pathan et al., 2007). The negative association between the attributes supports conventional wisdom, but other studies fail to establish any correlation between board independence and bank

performance (Adams and Mehran, 2005; Akhigbe and Martin, 2006), with the exception of Pathan et al. (2007). Secondly, evidence indicates that risk-taking is statistically significant and negatively related to board size and powerful CEOs.

Thirdly, board independence and risk-taking are negatively associated (Akhigbe and Martin, 2008; Pathan, 2009). This evidence can be interpreted as supporting the idea that bank-independent directors are being more responsive to regulatory compliance risks. Finally, there is a positive association between the percentage of independent directors and risk (Staikouras et al., 2007).

Table 2-2 Summary of board structure for financial institutions

This reports a summary of research into the board structure. Unless otherwise stated, all studies in this table refer to Board structure.

Explanatory variable		Sample characteristics		Measure of risk	Sign	Measure of performance	Sign
	Author(s)	Data period	Institutions Number				
Board size	Staikouras et al. (2007)	'02-'04	58 banks*	Loans to total assets, equity to total assets, and loan loss provisions to total loans ratios	Negative		
	Pathan (2009)	'97-'04	212 BHCs	Equity volatility, systematic, idiosyncratic and z-score	Negative		
Board independence	Staikouras et al. (2007)	'02-'04	58 banks*	Loans to total assets ratio	Positive		
	Pathan (2009)	'97-'04	212 BHCs	Capital market risk proxies and z-score	Negative		
	Akhigbe and Martin (2008)			Total risk and unsystematic risk	Negative		
Board size	Adams and Mehran (2005)	'52-'99	35 BHCs			Tobin's Q	Positive
	Andres and Vallelado (2008)	'96-'05	69 banks*			Tobin's Q	Positive/negative and nonlinear
	Staikouras et al. (2007)	'02-'04	58 banks*			ROA, ROE and Tobin's Q	
	Pathan et al. (2007)	'99-'03	25 banks			ROE and Sharp ratio	Negative
Board independence	Adams and Mehran (2005)	'52-'99	35 BHCs			Tobin's Q	No association
	Akhigbe and Martin (2006)	'01	201 banks			Average abnormal return	Positive

	Pathan et al. (2007)	’99-03	25 banks			ROE and Sharp ratio	Positive
	Andres and Vallelado (2008)	‘96-‘05	69 banks*			Tobin’s Q	Positive/negative and nonlinear
Board monitoring index	Sierra et al. (2006)	’92-’97	76 BHCs			ROA	Positive
	Akhigbe and Martin (2006)	‘01	201 banks			Average abnormal return	Positive
CEO-Chair position	Simpson and Gleason (1999)	‘89-‘93	375 banks	Logit (financial distress)	Positive		
	Pathan (2009)	‘97-‘04	212 BHCs	Equity volatility, systematic, idiosyncratic and z-score	Negative		

*International sample used in the analysis. ROA refers to return on assets ratio.

2.2.3 Executive compensation

A third body of governance literature focuses on executive compensation. Agency theory has been widely used in the executive compensation literature since the 1980s (Murphy, 1999). Under this theoretical cornerstone, the view is that the executive compensation structures can be shareholders' value-enhancing incentives designed to reduce agency conflicts. Long-term managerial incentive-based awards to managers have extremely high sensitivity to changes in firm value relative to cash-based contracts. As such, stock and stock option (long-tem compensation) can be employed by shareholders to encourage risk-averse managers to direct corporate resources into risky value-enhancing investment projects (Smith and Stulz, 1985). Likewise, short-term fixed compensation (cash-based incentive) may discourage entrenched CEOs from direct investment into risk increasing net present-value projects. However, a competing theory from Noe et al. (1996) posits that cash bonus remuneration may lead to risk-shifting in financially distressed banks during a deregulatory regime.

On the empirical front, one substantial body of literature examines the sensitivity of the CEO's wealth to performance or delta (Barro and Barro, 1990; Hubbard and Palia, 1995; Crawford et al., 1995; Fields and Fraser, 1999; Harjoto and Mullineaux; 2003)[24]. Delta can be defined as the sensitivity of wealth to a percentage change in stock price. These articles indicate a statistically significant and positive association between CEO pay and bank performance, consistent with the principal-agent model. Barro and Barro (1990) document a positive and statistically significant association between CEO pay and bank performance (measured by stock returns to shareholders, and rate of return). They also show that CEO's pay-performance sensitivity is a decreasing function of both the CEOs' experience and the length of period CEOs continue in office. The latter four articles provide evidence that bank performance measures are positive and statistically significant in CEO pay regression models, which is consistent with contracting theory (Smith

[24] Stylised facts on industrials can be found in Jensen and Murphy (1990), Murphy (1999), and Hartzell and Starks (2003). For instance, Murphy (1999, p. 53) documented that "pay-performance sensitivities are driven by stock options and stock ownership and not through other forms of compensation". However, Aggarwal and Samwick (1999) report that the association between stock return volatility and pay-performance sensitivity is negative. According to Guay (1999), delta exposes a manager to more risk, and he defined it as the dollar change in the value of CEO stock and option portfolio (wealth) coming from a one percent increase in the firm's stock price (wealth for a 1% change in stock price).

and Watts, 1992). This theory predicts that substantial managerial equity-based compensation reduces agency risk. The contracting theory predicts higher levels of executive compensation in firms with more growth options and investment opportunity sets, and lower ones in regulated firms. The substitutive effects of regulatory intervention, ownership restrictions and meagre stock options are perceived to support the failure of this theory in banks.

In their most recent paper, Cuñat and Guadalupe (2009) indicate the substitution of cash-based compensation (fixed pay) for stock option grants (variable pay). They report a positive pay-performance sensitivity following increasing competition during the second wave of deregulations in the 1990s. By way of comparison, Fahlenbrach and Stulz (2011) report that return on assets is significant and negatively related to dollar gain for a 1% increase in shareholder value. This finding suggests that banks with CEOs whose incentives were better aligned with the interests of shareholders performed badly through the recent credit crisis.

Some researchers compare pay packages. Houston and James (1995) and John and Qian (2003) have made a comparison between bank deltas and those of non-bank firms, which resulted in mixed findings. Houston and James (1995) found that pay-performance in banks is higher than in non-banks, with John and Qian (2003) finding the converse. The differences in CEO compensation measurements, and distinct time periods might explain this variation. Besides, Houston and James (1995) find no direct link between CEO compensation and bank risk-taking, indicating no support for the moral hazard hypothesis[25]. They also highlight the fact that CEOs receive both less cash compensation and a lower percentage of their total compensation, hold fewer stock options and are less likely to participate in stock options. They attribute these differences to the nature of a firm's assets and investment opportunity sets, which is consistent with the contracting hypothesis. Collins et al. (1995) demonstrated that total real compensation and a proportion of incentive compensation to total compensation increased significantly with investment opportunity sets at regional bank holding companies over the light-touch regulatory environment. Growth opportunity is proxied by noninterest income to total revenue and natural log of firm size.

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[25] Houston and James (1995) regress the ratio of CEO stock to total stock outstanding, and the value of options granted to cash compensation on variance in stock returns.

Additionally, fixed payment and total pay packages of executives decreased and increased, respectively (Cuñat and Guadalupe, 2009), and the equity-based compensation received by directors in banks in the early 1990s was significantly less than those in industrial firms, but was comparable by 1999 (Becher et al., 2005)[26]. DeYoung et al. (2010) found that boards adjusted bank CEO compensations to induce managers to pursue new growth opportunity sets. They report the presence of larger risk-taking incentives in banks relative to non-financial firms around the year 2000. In particular, they show that distance to default is negatively related to vega and delta, respectively. They argued that policies associated with deregulation and reform - i.e. the GLBA - should be attributed to contractible risk-taking behaviour.

The central insight of the above stream of research is that, subsequent to these programmes, together with the exogenous shock and innovation in the financial sector, the bank managerial compensation structure and level have changed to mirror those in industrial firms. From the empirical evidence to date, the "contracting theory" does not predict less equity-based compensation in regulated sectors. Angbazo and Narayanan (1997) and Harjoto and Mullineaux (2003) indicate that CEO pay (stock and options grants) positively influence BHCs leverage-measurement of observable risk. Harjoto and Mullineaux (2003) also indicate a positive association between stock return volatility and incentive compensation for CEOs (stock and option grants). Angbazo and Narayanan (1997) find no association between these parameters, possibly because stock and option grants were still on the low side when this research was conducted.

Besides, Harjoto and Mullineaux (2003) report that CEO salaries (but not bonuses) increase when there is stock return volatility. John and Qian (2003) and Harjoto and Mullineaux (2003) also report that CEO incentive pay is a decreasing function in the interaction of the variability of total return to shareholders, as do Garen (1994) and Aggarwal and Samwick (1999)[27]. Similar to the above papers, Brewer et al. (2003) regress managerial incentives on bank risk. They find that equity-based compensation is positively related to stock return volatility, and argue that their results were produced by the competitive deregulatory environment in

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[26] Murphy (1999) documents a substantial increase in stock options, and a major increase in top executive remuneration over the period 1992-1996.

[27] Theories suggest that the determinants of the structure of CEO pay include firm characteristics (risk, leverage, market-to-book ratio, risk) and CEO characteristics (tenure).

which banks were operating. In addition, Brewer et al. (2003) highlight lower levels of stocks and options grants in banks, as found by Houston and James (1995).

Another drawback of the above research is that it lumps stock and option grants together when, according to John and John (1993) and Narayanan (1996), it is important to disentangle them because each aspect of the contract invokes different incentives to managerial investment decisions. After separating all-stock from all-cash contracts, Narayanan (ibid) shows that they lead to long-term overinvestment and underinvestment, respectively. He also reports that when equity and cash incentives are lumped together; can lead to efficient corporate investment decisions. Empirical research that regresses bank risk on managerial incentive compensations includes that of Chen et al. (2006), Mehran and Rosenberg (2008), DeYoung et al. (2010), and Vallascas and Hagendorff (2010). This strand of the literature argues that equity-base incentive is important in mitigating managerial risk-aversion behaviour in banking firms[28]. The above empirical studies provide evidence of apparent managerial risk-taking incentives and equity-based compensation. Principally, equity-based compensation induces risk-averse managers to pursue risky operational and policy choices.

In US commercial banks, Chen et al. (2006) find that risk varies directly with CEO stock-options. Mehran and Rosenberg (2008) have found that CEO option pay (portfolio vega) and bank risk (measured by total equity return volatility, residual of stock return volatility and asset volatility) are strongly positively connected. The vega, or the sensitivity of CEO wealth to the volatility of equity value (risk), is defined as the dollar change in the value of CEO stock and option portfolio for 0.01 changes in the standard deviation of stock returns (Guay, 1999). DeYoung et al. (2010) point out that market risk measures and policy variables increase in CEO portfolio vega. Specifically, they show that total risk, systematic risk, idiosyncratic risk, noninterest, and private mortgage-backed securities are positive and significantly related to vega, as Mehran and Rosenberg (2008) have

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[28] In industrials, extant empirical work is associated with business policy choices. This study connects CEO portfolio vega to risk-taking. For instance, while stock return volatility (Guay, 1999; Rajgopal and Shevlin, 2002) is positively related to the contemporaneous vega, leverage (Coles et al., 2006) is positively associated with previous vega and negatively related to delta, respectively (Coles et al., 2006). Conversely, modelling vega endogenously, Coles et al. (2006) indicate that CEO risk-taking incentive is a positive function of stock return volatility. Both stock return volatility and leverage have been utilised as measurements of firm risk. Low (2009) notes that firms responded to the increased legal rules and institutions of Delaware takeover protection through increasing CEOs' portfolio vega.

also found. Delta enters negatively on these risk measures. In line with the theoretically predicted directions, Vallascas and Hagendorff (2010) show that distance to a default indicator is negatively related to CEO stock options and positively associated with bonus payment. By contrast, Fahlenbrach and Stulz (2011) find no relation between vega and banks performance (ROA) through cross-sectional regressions. In fact, evidence from this study suggests that higher CEO vega did not lead to greater risk-taking during the recent banking crisis (in particular with respect to stock options).

C. Summary

The above stylised facts offer some insights into managerial risk-taking incentives and executive compensation in banking firms. However, conflicting results have been produced. Firstly, widespread empirical evidence documents a positive and statistically significant relation between the CEO compensation package and the performance of the bank. Secondly, there is evidence of a positive and significant relationship between risk-taking and equity-based compensation, which is consistent with the theoretical predictions and empirical evidence (Chen et al., 2006; Mehran and Rosenberg, 2008; DeYoung et al. 2010; Vallascas and Hagendorff, 2010). Thirdly, a recent stream of research shows that the larger the equity-based compensation of the executive package, the higher the vega (driven by larger stock option composition), and this leads to greater managerial risk-taking incentives. However, in early studies of regulated firms, the contracting theory is not supported by the promotion of risk-taking (Houston and James, 1995), and tight restrictions and meagre managerial stock option holdings were drivers for the failure of this hypothesis.

Table 2-3 Summary of managerial compensation for financial institutions

This reports a summary of research into managerial compensation. Unless otherwise stated, all studies in this table refer to managerial compensation.

Explanatory variable		Sample characteristics		Risk measures	Sign	Performance measures	Sign
	Author(s)	Period	Institutions Number		Sign	Measure	
Panel A: Compensation as independent variable							
Stock and option	DeYoung et al. (2010)	'94-'06	114 banks	Total, systematic, and idiosyncratic risk	Negative		
	Mehran and Rosenberg (2008)	'92-'02	549	Equity volatility and residual volatility	Positive		
Vega /stock option grants	Mehran and Rosenberg (2008)	'92-'02	549	Equity volatility and residual volatility	Positive		
	DeYoung et al. (2010)	'94-'06	114 banks	Total and systematic risk, and noninterest income	Positive		
Stock option-compensation	Vallascas and Hagendorff (2010)	'93-'07	172 banks	Distance to default	Negative		
	Chen et al. (2006)	'92-'00	68 banks	Capital market risk proxies	Positive		
Stock compensation	Saunders et al. (1990)	'78-'85	38 BHCs	Capital market risk proxies	Positive		
	Chen et al. (1998)	'88-'93	302 thrifts	Capital market risk measures	Positive		
Salary and bonus	Vallascas and Hagendorff (2010)	'93-'07	172 banks	Distance to default	Positive		
Delta (pay-performance sensitivity)	Barro and Barro (1990)	'82-'87	330 banks			ROA and stock returns	Positive
	Crawford et al. (1995)	'76-'88	124 banks			CEO wealth	Positive
	Hubbard and Palia (1995)	'80-'89	147 banks			Shareholder wealth	Positive
	Fields and Fraser (1999)	'81-'95	56 banks			Net income and shareholder value	
Delta (pay-performance sensitivity)	John and Qian (2003)	'92-'00	120 banks			Change in shareholder value	Positive

Delta (pay-performance sensitivity)	Harjoto and Mullineau (2003)	'92-'00	438 BHCs			Return on dividend yield	Positive
	Fahlenbrach and Stulz (2011)	'06	98 banks			ROA	Negative
Vega	Fahlenbrach and Stulz (2011)	'06	98 banks			ROA	No association
Panel B: Compensation as dependent variable							
Explanatory variable				Dependent(risk measures)			
Delta (pay-performance sensitivity)	Houston and James (1995)	'80-'90	134 banks	Equity volatility	No association		
	John and Qian (2003)	'92-'00	120 banks	Volatility of the equity value change	Positive		
				Leverage	Negative		
Stock and option	Harjoto and Mullineau (2003)	'92-'00	438 BHCs	Equity volatility	Positive		
				Leverage	Positive		
Total equity-based compensation/total compensation	Brewer et l., (2003)	'92-'00	100 BHCs	Stock return volatility	Positive		
	Cuñat and Guadalupe (2009)	'99-'02	Financial services			Shareholder wealth	Positive
Salary and bonus	Cuñat and Guadalupe (2009)	'99-'02	Financial services			Shareholder wealth	Positive
Stock return volatility	Harjoto and Mullineau (2003)	'92-'00	438 BHCs	Salary	Positive		
Leverage		'92-'00	438 BHCs	Stock and option grants	Positive		
Leverage	Angbazo and Narayanan (1997)	'89	97 banks	Equity based compensation	Positive		
Market to book value of equity	Benston and Evan (2006)	'88-'94	141 banks	Bonus	Positive		

*International sample used in the analysis. ROA refers to return on assets ratio.

2.2.4 Market discipline and subordinated debts and debentures

Flannery (1998) observes that reasonable market discipline measures should be included in the corporate governance of large publicly traded bank holding companies. This is also emphasised in pillar 2 of Basel II. Flannery and Sorescu (1996, p. 1356), note that “market discipline can be described as the process by which informed market investors gather and evaluate information about a firm's activities and prospects, and incorporate that information into its traded securities”. From this definition, it can be seen that the key issue is that uninsured market investors face bank sub-debt costs that increase as banks pursue risky strategies as a result of federal guarantees - i.e. there is a positive association between bank risk-related accounting information and subordinated debt yields.

Accordingly, if banks compensate unprotected depositors disproportionally, they may punish banks for greater risk-taking. These private sector agents can discipline banks by partly withdrawing uninsured deposits, demanding higher rewards, or shifting to credible and low risk-profile banks (Martinez-Peria and Schmukler, 2001). This move can help banks to reduce the extent of risk-taking, thus, avoid collapsing, and is consistent with the market discipline hypothesis, which centres primarily on interest rates paid on deposits, deposit growth, and market information signals. Market investors in equity differ from uninsured market investors in bank sub-debt securities. However, the former are generally junior claimants over the firm’s assets, whereas the latter are senior ones (Gorton and Santomero, 1990).

One branch of the literature analysing market discipline examines interest rates (Baer and Brewer, 1986; Hannan and Hanweck, 1988; Martinez-Peria and Schmuckler, 2001) and level or growth rate in deposits (Martinez-Peria and Schmuckler, 2001). While the former empirical evidence shows that bank risk factors (i.e., the non-performing loans ratio or standard deviation of stock returns) and yields on deposits are positively associated, the latter evidence indicates a negative correlation between bank risk fundamentals (i.e., the non-performing loans ratio) and deposit change. By contrast, Park and Peristiani (1998) find that yield on deposits and deposit growth are positively and negatively associated with the probability of failure in the thrift institutions, respectively. The results found by these research papers support the theoretical predictions. Alternatively, the explicit deposit insurance (i.e. the bank safety net) generates moral hazards that increase

bank risk-taking by weakening market discipline (Baer and Brewer, 1986; Demirguc-Kunt and Huzinga, 2004; Gropp and Vesala, 2004)[29].

Previous empirical studies that analyse financial markets' disciplining of banks' actions through pricing their uninsured debts according to their risk profiles have produced diverse results. These securities refer to jumbo certificate of deposits (CDs), subordinated notes and debentures, and federal funds[30]. Compared to insured depositors, claimants of uninsured securities are more vulnerable to systematic risk in the event of bank failures. During bank runs, market depositors reallocate their expectations of future deposit losses[31]. This strand of research examines market discipline around the sensitivity of subordinated notes and debentures spread or yield sensitivities to balance sheet risks. The findings of these studies are inconclusive.

The credit spread of subordinated notes and debentures (SNDs) is defined by Krishnan et al. (2005, p. 344) as "the difference in basis points between the yield to maturity of the issue and the yield of an equivalent Treasury security". Some studies find that SND yields are not statistically related to bank-specific balance sheet information (Avery et al., 1988; Gorton and Santomero, 1990; Krishnan et al., 2005). However, the absence of strength does not mean that investors are insensitive to a bank's specific risk. Gorton and Santomero (1990) argue that the lack of tension between bank risk-accounting data and market indicators could be due to the failure to employ theoretical framework models for estimating bank SNDs. In addition, some literature contends that lenders of last resort and conjectural government protection absorb enormous default losses on large banks

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[29] Demirgüç-Kunt and Tolga (2001) define 'explicit deposit insurance' as that in which some form of legislation (such as a central bank law, banking law, or other constitution) establishes a guarantee scheme for deposits. Other countries, for example Hong Kong, promote the private sector monitoring of banks through the "no insurance policy" (Gay et al., 1991).

[30] While federal funds refer to uninsured and uncollateralised deposits borrowed from other banks (i.e., interbank loans), a CD is a receipt for time deposit that can be traded in the secondary market issued by deposit accepting (negotiable) institutions. Generally, CDs are denominated in substantial monetary values – e.g. US$.

[31] The insolvency at Northern Rock Bank in September 2007 was accompanied by the global banking panic. In response to this episode, Gordon Brown, the UK former Prime Minister proposed that the bank be privatised, and put in place a bank bail-out policy to head-off banking fragility and economic spiral. The bank was nationalised as the most risk-averse way to protect depositors, and of which indirect bail-out costs were passed on to taxpayers (http://www.moneymorning. com/2008). Brown's model was later borrowed and adopted by other nations, including the US, on similar grounds.

attributed to a weaker predictive performance of yield spread (Flannery and Sorescu, 1996; Gropp and Vesala, 2004, and others)[32].

Numerous studies show that SNDs risk premia are sensitive to bank balance sheet characteristics (Flannery and Sorescu, 1996; Flannery, 1998; Evanoff and Wall, 2001; DeYoung et al., 2001; Hancock and Kwast, 2001; Sironi, 2003; Goyal, 2005). These findings have been prominent since the Federal Deposit Insurance Corporation Improvement Act of 1991 enactment. For example, Flannery and Sorescu (1996) and Sironi (2003) demonstrate that yield spread is positively associated with financial leverage and the non-performing loans ratio, which is consistent with the theoretical predictions. Risk premia on SNDs is also negatively or positively related to profitability (return on asset). While the former relationship is attributed to either profit monopoly or greater efficiency, the latter positive sign on the return on asset is generated through compensating for more risk-taking. These two studies conclude that bank risk fundamentals explain the cross-sectional differences in SND yields. That is, private investors *do* discipline and mitigate bank default risks. Using sub-debts from different data sources that were issued by the same banks, Hancock and Kwast (2001) indicate that sub-debt yield spreads are generally consistent across surrogate sources for the most liquid bond issues. These were bonds characterised by relatively large issuance in size, relatively young in age, issued by relatively large BHCs, and relatively traded in strong overall bond market.

In a different context, Evanoff and Wall (2001) take the reverse approach, and demonstrate that risk-capital-based ratio indicators have poor predictive powers on a bank's condition in comparison to sub-debt yield-problem bank indicators. In Evanoff and Wall's (ibid) paper, bank fragility is proxied by CAMEL composite or BOPEC composite supervisory rating downgrades. In fact, this study offers insights into the existence of causation of the bank risk characteristics and sub-debt yield association. However, the endogenous problem is not controlled in other studies, with the exception in those employing fixed-effect estimators. Generally, these risk premia papers on SNDs support the theoretical position that the credit risk portion of sub-debt yield spreads reflect default risk

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[32] A recent forestall occurred on 3 October 2008, when the US House of Representatives approved a $700 billion (396 billion pound) Wall Street bail-out package for US banks with poor loan portfolios/toxic assets. The government equity participation move was designed to shore up banks' capital with taxpayers' money, and was perceived as a form of part-nationalisation.

A further strand of research looks at financial markets from the distance to default indicator perspective. The thread running through this research offers a theoretical framework for understanding the structural model of default probabilities derived from Black and Scholes (1973) and Merton (1974) – BSM. Distance to default is a special model derived from the corporate debt structural default model. The BSM has previously been used in empirical work[33]. Default occurs when the value of assets to debt ratio is less than one – i.e. when its natural log is negative (Vassalou and Xing, 2004).

Vassalou and Xing (2004) delineated a number of advantages that the BSM framework has over others, which are based on the fact that BSM does not require assumptions related to the integration of bond and equity markets. Firstly, it uses the market value of the firm's equity to calculate its default risk. Secondly, it estimates its market debt value instead of using the book debt value, and takes into consideration the firm's asset volatility in estimating the firm's default risk. Out of eight assumptions, the BSM model looks at two salient assumptions, which are that both the dynamics for the total value of a firm and a firm's trading in assets take place continuously over time[34]. The former assumption necessitates that price movements are continuous, and that (unanticipated) returns on securities are serially independent, which is consistent with the efficient market hypothesis, although the former assumption presupposes that market securities are frequently open for trading.

As a result of the influential work on default probabilities by Moody's/KMV [1990], Merton's (1974) distance to default model has also become a popular market risk proxy in the banking industry (Duffie et al., 2007). Based on this theoretical keystone, distance to default is deemed to be a potentially useful tool due to its ability to model and predict corporate default risk relative to traditional accounting ratio-based models, as it carries more information (Hillegeist et al., 2004; Gropp et al., 2006; Campbell et al., 2008). Agarwal and Taffer (2008) compare the performance of a market-based approach with accounting-ratio-based models (i.e., Altman's (1968) z-score or Ohlson's (1980) z-score) in bankruptcy prediction.

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[33] Examples of empirical studies on industrials include, amongst others: Hillegeist et al. (2004), Vassalou and Xing (2004), Duffie et al. (2007), Bharath and Shumway (2008), and Campbell et al. (2008).

[34] Merton (1974) argues that many of these assumptions (i.e. the remaining six) are not necessary for the model to be obtained, but are chosen for expositional convenience.

Interestingly, the authors demonstrate that the variation in predictive accuracy between the two models is insignificant, as Hillegeist et al. (2004) illustrate. In essence, the accounting-ratio system is criticised for lacking a theoretical foundation. Similarly, Agarwal and Taffer (2008) underscore Basel II's flexibility in enabling banks to use internal rating-based approaches to set capital charges with respect to the credit risks of their portfolios, as poor credit models could lead to sub-optimal allocations of capital.

In recent times, studies that utilise risk with equity market-based distance-to-default are growing slowly in the banking firms. The only published works that employ a similar methodology, and connect distance to default with a specific balance sheet of information are those of Gropp et al. (2004, 2006), and Akhigbe et al. (2007). In a sample of European banks, Gropp et al. (2004, 2006) examine whether the spread on SNDs and distance-to-default indicators are appropriate predictive indicators of the banking condition. Gropp et al. (2004) indicate that bank fragility (i.e., proxied by either negative distance to default or the spread on sub-debt) decreases as the market value of the firm's assets increase, and increases with respect to leverage and asset volatility. Moreover, they argue that the distance to default indicator is characterised by a superior predictive power, and is thus more revealing than the SND spread signal.

Gropp et al. (2006) also show that negative distance to default is statistically significant and positively related to composite score[35]. An increase in negative distance to default (DD) explains a higher bank distress condition, similar to that of spread. Contrastingly, Akhigbe et al. (2007) find that the default likelihood indicator is negatively related to capital, size, and the market to book ratio, but positively related to financial leverage and return on assets, in a manner consistent with the theoretical predictions. They contend that the Fed policy actions can have different impacts on the conditions of banks. For instance, during a period of explosive increases in interest rates, default likelihoods also increase, and vice versa. Although both these papers analyse commercial banks, they have differing approaches.

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[35] The composite score is obtained by summing up the score of capital adequacy, asset quality, management, and earnings indicators. The study by Gropp et al. (2006) comes close to that by Evanoff and Wall (2001) with respect to the construction of the composite score of CAMEL supervisory rating grades.

While Gropp et al. (2006) use composite scores for bank balance information, Akhigbe et al. (2007) employ numerous accounting indicators. The former and the latter proxy bank fragility with negative distance to default and default likelihood indicators, respectively. However, the above research on distance to default analyse commercial banks. Equity price signals have been considered inappropriate for bank regulatory supervisors (Gropp et al., 2006). This is because equity holders benefit from the upside gains that accrue from increased risk-shifting, which leads to increased asset volatility. Other research examines distance to default from the bank's capitalisation perspective (Elyasiani and Jia, 2008; Flannery and Rangan, 2008). These two studies show that well capitalised-banks are associated with lower default risks – i.e. they have greater margins for defaulting and vice verse. Importantly, some literature has proposed that large banks should issue mandatory subordinated debts and debentures as part of their capital structures, which would not be covered by guarantees (Evanoff and Wall, 2001; Flannery, 2001; Hancock and Kwast, 2001; Sironi, 2003; Krishnan et al., 2005). The mandatory SND issuance is referred to as a market discipline tool and the surveillance of excessive risk-taking in large banks is examined by the Basel Committee on Banking Supervision's consultative paper on capital adequacy (1999) and the Gramm-Leach-Bliley Act of (1999).

Finally, the literature that advertises a valuable bank charter as a decreasing function of bank risk-taking includes Marcus (1984), Keeley (1990), Gorton and Rosen (1995), Galloway et al., (1997), and Goyal (2005). A bank's charter-value is here understood as the sum of all the benefits enjoyed by bank stakeholders (including reputational effects as well as scale and scope economies) that would be lost in the event of default. Higher charter values may thus help to constrain risk-taking behaviour of bank managers, as valuable bank charters cannot be sold on in the event of default. That is this tends to discourage them from engaging in excessive self-harming risk-taking. Contrastingly, banks with higher market power (i.e. with a higher market to book value ratio) hold more capital relative to assets, which leads to a lower default risk (Keeley, 1990). Equally, higher-quality banks are allowed a relatively larger asset base than lower quality ones, and are subjected to lower capital adequacy requirements (Elyasiani and Jia, 2008). Hence, a higher bank capital ratio is important, and provides an incentive for mitigating risk-taking behaviour. Generally, bank capital and risk are negatively related.

D. Summary

To conclude, the survey of the literature supports the thesis that bank-distress risk is captured by market discipline signals. Firstly, the evidence indicates that yields on deposits and deposit growth are sensitive to banks' balance-sheet specific risks. Secondly, empirical evidence supports the hypothesis that both equity market-based distance to default and the spread on SNDs are suitable signals for predicting bank stability (Gropp et al., 2004, 2006; Akhigbe et al. 2007), but that the distance to default signal performs better in predicting stability than the risk premia on SNDs. However, the two may work well in conjunction. Thirdly, findings show that negative distance to default is a decreasing function of the market value of the firm's equity, and an increasing function of the volatility of its assets and leverage (Gropp et al., 2004). Finally, the issuing of mandatory subordinated notes and debentures by large bank holding companies is a policy issue. Taken as a whole, market discipline resulting from private investment in bank sub-debts is important for regulating banks, both in terms of assessing their condition or stability, and for attenuating risk-taking behaviour.

Table 2-4 Summary of market discipline in banks

This reports a summary of research into market discipline. Unless otherwise stated, all studies in this table refer to market discipline.

Dependant variable		Sample characteristics		Risk measures/ explanatory variable (s)	
	Author(s)	Period	Institutions Number	Measure	Sign
CD rates	Cargill (1989)	'84-'86	58 banks	Capital to asset ratio, loan loss provision, interest rate exposure, and average maturity of the outstanding CDs	Positive
Interest rates paid	Martinez-Peria and Schmuckler (2001)	'80s-'90s	Banks*	Capital to asset ratio	Negative
				Non-performing loans ratio	Positive
				cash to assets	Negative
				Bond to assets	Negative
	Demirguc-Kunt and Huzinga (2004)	'90-'97	Banks*	Capital to asset ratio	Negative
				ROA	Negative
				liquid assets to total assets	Negative
Deposit growth	Martinez-Peria and Schmuckler (2001)	'80s-'90s	Banks*	Capital to asset ratio	Positive
				Non-performing loans ratio	Positive
				real estate loans to total loans	Positive
				ROA	Positive
				Bond to assets	Negative
	Demirguc-Kunt and Huzinga (2004)	'90-'97	Banks*	Capital to asset ratio	Positive
CAMEL ratings	Evanoff and Wall (2001)		100 BHCs	SND yield spreads	Positive
				Capital ratios	Positive
Insurance status	Wheelock and Kumbhakar (1995)	'10-'20	212 banks	Capital to asset ratio	Negative
				Surplus to loans and ROA	Negative
				Bonds to assets, loans to assets, deposits to assets, accruing loans past due 90 day to total assets, real estate owned to total assets, and financial leverage	Positive
Equity capital to debt	Nier and Baumann	'93-'00	729 banks in 32 countries	ROE	Positive

and deposits ratio	(2006)				
				Provision for loan losses	Positive
				Asset volatility	Negative
SND yield spread	Avery et al., (1988)	'83-'84	100 BHCs	US treasury securities and cash to total assets (liquidity)	Negative
	Gorton and Santomero (1990)	'83-'84	37 BHCs	Balance sheet information	No association
	Flannery and Sorescu (1996)	'83-'91	83 banks	Non-accruing loans to total assets	Positive
	Krishnan et al. (2005)	'94-'99	185 banks & 3,265 non-banks	Balance sheet information	No evidence
	DeYoung et al. (2001)	'86-'95	1,079 banks	Liabilities to market value of equity (financial leverage)	Positive
				Loans past due ninety or more days to assets. (Asset quality)	Negative
				Other real estate divided to assets (asset quality)	Negative
	Sironi (2003)	'91-'00	407 banks	ROA	Positive
				Leverage	Positive
				Interaction of leverage and ROA	Negative
	Goyal (2005)	'74–'95	414 BHCs	Market-to-book assets ratio	Negative
				Demand deposits to total deposits	Positive
Distance to default	Gropp et al. (2006)	'90-'01	103 banks*	Composite score**	Negative
Default likelihood indicator	Akhigbe et al. (2007)	'99-'03	1,689 banks	Capital to asset and market-to-book ratios.	Negative
				ROE and financial leverage	Positive

*International sample used in the analysis. ROA refers to return on assets ratio. ** The composite index is calculated exclusively with four indicators, namely capital adequacy, asset quality, management efficiency and profitability. Liquidity was removed due to data limitation.

2.3 The Gap in the Literature

To sum up, the extensive literature synthesized in this chapter has revealed that there are several gaps which require filling. Firstly, whilst there is research examining the association between risk-taking and ownership structure (see Table 2-1) - a body of empirical research that limits itself to testing ownership structure on bank risk measures in isolation – this research does not 'parameterise' bank risk measures as a function of the diversity of governance mechanisms that might influence bank risk-taking. Therefore, examining board and ownership structure is also desirable here. Secondly, this investigation is not aware of any study that compares and analyses risk-taking behaviour ex-ante and ex-post the governance-strengthening standards introduced by the Sarbanes enactment and Regulation A in the 2003 amendment. In their cross-sectional analyses of the association between influence of disclosure and the governance on risk of financial firms, Akhigbe and Martin (2008) control for ownership structure. Thirdly, the literature on the relationship between managerial incentives and risk-taking incentives has never been tested by controlling board structure governance (Chen et al., 2006; Mehran and Rosenberg, 2008; DeYoung et al. 2010; Vallascas and Hagendorff, 2010). Lastly, as a result of unsettled empirical and theoretical conclusions, together with a limited number of studies, empirical research on board structure and risk-taking studies is an invaluable contribution to this literature (Staikouras et al., 2007; Pathan, 2009).

In reviewing the market-discipline literature the following emerges: First, the link between the bank-specific balance sheet information and distance to default – the risk market measure – is not fully addressed (Gropp et al., 2004, 2006; Akhigbe et al., 2007). In fact, this is fundamentally an empirical question. Two, the literature is limited as it does not compare the predictive power of SND banks against that of non-SND banks. This has not (to my knowledge) been systematically examined using the distance to default indicator.

Research focus: The objective of this study is two-fold. Firstly, the connection between bank risk fundamentals and distance to default in sub-debt and non sub-debt banks will be explored. The underlying question here is whether distance to default exhibits higher predictability in sub-debt banks in comparison to banks that do not issue mandatory subordinate debt. Market indicators are perceived as

important by supervisors in terms of being either complementary to accounting data or providing substitutions for it in predicting a bank's financial status (Flannery, 1998; Sironi, 2003; Gropp et al., 2006). Secondly, this thesis undertakes further investigations into the impact of board and ownership governance and executive compensation on bank risk. Some studies note that unsound bank governance and managerial compensation contributed to greater risk-taking in depository institutions (Chen et al., 2006; Adams, 2009; Pathan, 2009; Walker, 2009; DeYoung et al., 2010). In the present day, boards' failures to execute their fiduciary duties of loyalty, and bankers' excessive pay have become policy issues.

Moreover, in undertaking this investigation, a number of further issues are considered. One is the conflict of interest between bank managers and shareholders in risk-taking (Saunders et al., 1990). Addressing this problem is crucial for this relationship, as it extends to cover other parties as well – i.e. bank regulators and depositors – and in doing so, this study assesses the importance of multiple corporate control mechanisms in explaining alternative bank risk fundamentals. It also analyses executive incentive compensation and board governance on risk-taking and, finally, it considers how predictable distance to default and a number of bank risk fundamentals are in sub-debt banks in comparison to non-sub-debt banks (Flannery and Sorescu, 1996; Gropp et al., 2006). More details on methodological issues will be provided in Chapters 3-6.

Chapter 3: Data Collection and Construction of Variables

3.1 Introduction

This chapter describes the data sources and sample constructions that are used in Chapters 5 and 6. Data has been collected from two surrogate databases. The financial data is taken from Worldscope and the Fitch-IBCA Bankscope database and the annual reports are used to supplement this information to reduce the probability of the results being affected by missing observations. Data for financial variables are in US GAAP. This is because reports prepared in accordance with the GAAP system are deemed to contain maximum quality disclosures (Nier and Baumann, 2006). Data on corporate governance variables including ownership, board structure, and compensation was hand-collected using proxy statements (DEF-14A forms) submitted under SEC proxy rules. Proponents of archived data assert that data from proxy statements can be relatively expensive to access, and time consuming to collect, but it is a wealthy information surrogate source in terms of updating and ranking of ownership statistics (Anderson and Lee, 1997). However, Form 20 of the SEC requires banks to disclose more information than that required by regulators.

The remainder of this chapter is organised as follows. Section 3.2 presents the sample selection criteria. In Section 3.3, variable definitions are discussed. Section 3.4 reports some of the key descriptive statistics for the entire sample. In Section 3.5 and 3.6, I report descriptive statistics. Lastly, the summary and concluding remarks of this chapter are provided in Section 3.7.

3.2 Sample Selection Criteria

The sample for this investigation is based on 445 identified publicly traded BHCs accessed from the Bankscope database as at September 2006. In order for BHCs to remain within the final data set, the following criteria need to be met: Each BHC must have data on the Bankscope for at least two years during the period 2000-2005. In fact, this process does not address survivorship bias. This problem is minimised by creating 146-bank subsets of banks that are available for the whole

sample period[36]. Further to this point, failed, delisted, or acquired banks are insignificant and this assures sample continuity over time[37]. During the search for this data, a considerable number of missing financial observations in the Bankscope database was discovered. To address this problem, the Worldscope database was used. The information from these two sources was matched by using tickers and company names, so that information about the same firms was collated from these different databases.

Every depository institution in the sample was either a national commercial bank (SIC: 6021) or a state commercial bank (SIC: 6022), with proxy statement filings in the SEC. A national/federal chartered bank is perceived to be a high quality bank that receives first class supervision. Since the data sample used was from bank holding companies: thrifts (124), security brokers, dealers and floatation companies (2), real estate investment trusts (1), mortgage bankers and loan correspondents (3), miscellaneous business credit (1), life insurance (2), money centre (1), and commercial banks not classified elsewhere (1) are discarded from 455 BHCs[38]. Banks with no annual proxy statements on SEC (18) and banks with annual proxy statements on SEC, but with a notable number of missing financial observations (38) are also removed. Finally, 45 BHCs were searched and identified direct from SEC and the data re-collected from the proxy statement to ensure that the sample used is not less than 300 BHCs. As a consequence, the resulting final data sample contains 301 bank holding companies, and is presented in Table 3-1.

The sample selection of national or state commercial banks is important in the sense that they are regulated and supervised by almost the same legal institutional framework, namely: the Office of Comptroller of the Currency, the Federal Reserve System and the FDIC. The sample is categorised into three groups on the basis of asset portfolio size and q, hereunder: That is, small banks are those that fall in Q1, medium banks are those in Q2-Q4 and large banks are those in Q5. As pointed out by Gatev et al. (2009) large banks not only trade shares regularly, but are also

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[36] Adams and Mehran (2003) advocated that large distressed banks are liquidated by regulators. In the event of bankruptcy reorganisation, via acquisition by another bank, the target/failing bank often (but not always) loses its identity. In the worst-case scenario, the bank management of the target bank can be removed. However, its identity continues and, in turn, this minimises potential survivorship bias in the banking firm samples.

[37] According to the FDIC report, 24 banks failed between 2000 and 2005.

[38] Number of institutions discarded is indicated in brackets.

more active in lending than small banks and hold the majority of the US's banking assets.

This investigation focuses on US bank holding companies for a number of reasons: Firstly, with respect to asset portfolios, the US's economy is largely diversified in comparison to those of other countries. Secondly, the first decade of the 2000's was the era for new investment opportunities exploitation - following the deregulation and reform policies of the Gramm-Leach-Bliley Act of 1999. Thirdly, this banking sector is composed of both the world's large and small banking firms, suggesting a lower concentration in this industry than is present in other economies (Allen and Gale, 1995; Hanc, 2004). Finally, big depositors, in particular, sub-debt holders, are not protected by the depositor insurance scheme in BHCs, which gives them incentives to monitor and enhance market discipline in BHCs.

3.3 Proxies Construction

Data construction is divided into two parts – variables that are related to corporate governance, and firm-level characteristics. Data on corporate governance variables - ownership, boards, and compensation was hand-collected using proxy statements (DEF-14A forms) submitted under SEC proxy rules.

3.3.1 Construction for ownership and board variables

The source of ownership and board variables are the definitive proxy statements (DEF-14A forms) filed under SEC website. To provide investors with valuable information, publicly traded firms (including bank holding companies) are required by the Security Exchange Act of (1934) to file DEF-14A form with SEC. Each form consists of information on ownership structure – i.e. management, institutional and blockholders. It also contains information on board structure – i.e. board size and board composition-independent, gray and insider directors, as well as the position of the CEO in the board. Today, the separation of the CEO from Board Chairman's duties in the boardroom is emphasised the by legal and regulatory protocols.

Ownership structure: This includes managerial ownership, CEO ownership, institutional ownership and blockholder ownership. *Managerial ownership* is labelled as INSOWN and is used to proxy for insider ownership (Saunders et al., 1990; Anderson and Fraser, 2000; Booth et al., 2002). It is defined as the percentage of ordinary outstanding shares held directly by top executive officers, including the

CEO and directors. This variable is important in controlling for agency conflicts have in firm behaviour that significantly influence corporate value. As the managerial ownership level increases, managers have higher incentives to represent shareholders' value maximising interests. *CEO Ownership* is another proxy for insider ownership, denoted as CEOWN. It is used to proxy for the potential entrenchment of the CEO in terms of ownership concentration (Hillier et al., 2005; Coles et al., 2008; Cheng, 2008). It is defined as the CEO's percentage of shareholdings. It is based on outstanding shares and known under the acronym CEOWN.

Institutional ownership refers to the percentage of ordinary shares held by institutional investors. The institutional investors are characterised by their activism in pressurising managers to maximise value for shareholders – i.e. monitoring corporate behaviour. It is based on common equity shares under their voting control and is denoted as INSTOWN (Adams and Mehran, 2003; Konishi and Yasuda, 2004; Hartzell and Starks, 2003; Elyasiani and Jia, 2008). This proxy is used to capture ownership concentration. *Blockholder ownership* is a proxy for the percentage of shares held by blockholders with >=5% ownership of the banks' outstanding shares[39]. The measure for blockholders includes individuals, institutional investors and corporate business, and is denoted as BLOCK. Blockholders are influential in managerial decisions as they are associated with shareholders' value-maximising (Shleifer and Vishny, 1986; Mehran, 1995).

Board structure: Board structure variables are divided into board size, board composition, and Chairman/CEO split. The *board size* variable is used to proxy for the number of directors in the firm at the end of the financial year and is denoted as BDSIZE as used by Yermack (1996), Adams and Mehran (2005), Linck et al. (2008), Andres and Vallelado (2008), Pathan (2009), and others. The stylized fact from this empirical evidence supports the view in Jensen (1993) that larger boards in comparison to smaller ones are susceptible to higher agency problems as they can easily be controlled by CEO. Board size is an important element in firm governance. Compared to very large boards that are easily controlled by CEO, small boards are independent in corporate decision-making and activities co-ordination (Jensen, 1993).

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[39] This definition of blockholder ownership takes into accounts both institutional ownership and individual ownership. In this sense, it differs from that of Cremers and Nair (2005), which excludes non-institutional blockholders due to the difficulty of collecting reliable data.

Percentage of independent directors is denoted by the acronym FINBD, and used to proxy for board composition. This refers to outsider membership on the board, and is measured as the fraction of the board seats held by non-executive officers (with no financial or family relationship to management) divided by the total number of directors on the board (Yermack, 1996; Mak and Li, 2001; Booth et al. 2002; Cheng, 2008; Andres and Vallelado, 2008; Pathan, 2009). “Outside directors have incentives to carry out their tasks and do not collude with managers to exploit residual claimants” (Fama and Jensen, 1983, p. 315). An alternative view holds that they have closer incentives as those of shareholders. The power originating from CEO duality may affect the ability of the board’s monitoring capability (Hermalin and Weisbach, 1998).

SPLIT is a dummy variable equal to 1 where the chairman is also the CEO, but otherwise is set at 0. Brickley et al., (1997), Raheja (2005), and Adams and Ferreira (2007) argued that a CEO with a dual role faces a trade-off between information disclosure and intensive scrutiny by an independent board. TENURE captures the number of years served by the current CEO. Theoretically, as the tenure of the CEO increases, so does the firm’s performance. A CEO who performs well and has served for a long period has a higher probability of holding dual CEO-Chair posts (Brickley et al., 1997). This behaviour can be viewed as CEO entrenchment.

3.3.2 The construction of compensation measures

CEO compensation is gathered direct from the proxy statement of each bank SEC website. A diversity of proxies has been used to capture the structure of compensation for the CEO. The level of pay or direct compensation is defined as including the total of salary, bonuses, and the value of stock and options grants. Each form of compensation affects CEO behaviour differently on the corporation (Nayaranan, 1996). Virtually, cash-based and equity-based compensation are separated to ascertain their implications and incentives on risk-taking.

C*ash compensation* is defined as the total salary and bonus compensation (Mehran, 1995; John and Quin, 2003; Hartzell and Starks, 2003; Brick et al., 2006; Benston and Evan, 2006; Vallascas and Hagendorff, 2010). *Equity-based compensation* is defined as including stock option and common stock values. Again, consistent with the proposal by Nayaranan (1996), equity-based

compensation is disentangled from stock and stock options. Theoretically and empirically, incentive effects of stock ownership or stock option compensation on managerial investment decision vary as do to firm performance and risk-taking. Accordingly, the relevance of executive compensation on firm performance is well-documented (see Table 2-3). The common stock value is calculated by multiplying the number of shares of each CEO holdings and closing stock price at the end of each period, and is denoted as CEO-STOCK. CEOs' holdings information for the years is gathered as the date of the proxy statement. Information on closing stock price is downloaded from Datastream database. CEO stock option valuation is based on Black-Scholes methodology and it is discussed below.

3.3.2.1 CEO stock option value estimation

Stock options granted are valued using the Black-Scholes option-pricing model (1973), on the assumption that investors are risk-neutral and that all assets appreciate at the risk-free rate. The information regarding the number options granted to the CEO, exercise price per option share and expiration date or time to maturity in years were hand collected from the proxy statement on yearly basis - i.e. from the executive compensation section. Where the exercise price is not reported in the statement, this price is estimated by taking the mean of the stock prices – i.e. opening price plus closing price divided by two. Information over closing stock price, dividend yield and equity return volatility is gathered from Datastream database. Following Guay (1999), Chen et al. (2006), Coles et al. (2006), among others, the Black-Scholes formula for European call option valuations, as modified by Merton (1974), to account for continuously paid dividends is used. Thus, call option value is estimated in equation (3.1):

$$\text{Call option value} = [Se^{-dT} N(Z) - Xe^{-rT} N(Z - \sigma T^{1/2}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

where;

$$Z \text{ is the } [\ln (S/X) + T(r-d+\sigma^2/2)]/ \sigma T^{(1/2)}$$

N: Cumulative probability functions for the standard normal distribution.

S: Price of the underlying stock as of December 31 for each period.

X: Exercise price of the option is obtained from the proxy statement, as at December 31. For missing observations, the exercise price is estimated by dividing the total of the stock prices at the beginning and closing over two (Guay, 1999).

σ: Annualised equity-return volatility from the Datastream.

r: ln (1+risk-free interest rate), where, r is the natural logarithm of the risk-free interest rate of the yield on a 10-year US government Treasury-Bond, with constant maturities on December 31, 2000.

d: ln (1+dividend yield), d is the natural logarithm of the expected dividend rate on the underlying stock paid during the year.

T: Remaining time to maturity of the option in years. In case grant date information is not available in the proxy statement, T is set equal to 10 years at the grant date. This is because a large number of options issued in the sample have ten-year duration.

Subsequently, for a portfolio of N stock options, the option value is equal to the call option value (estimated by Black-Scholes model) multiplied by the number of options granted to the CEO. Black-Scholes option value is denoted as CEO-OPT. In the end, the CEO option value is used as a component of equity based compensation and total compensation/direct compensation. Accordingly, managerial compensation incentives are presented in Chapter 6.

3.3.3 Construction for firm specific variables

Information to compute financial variables are downloaded direct from Worldscope and the Fitch-IBCA Bankscope databases.

Tobin's Q calculation: Tobin's Q (Q), as a traditional firm performance proxy, has been used in a range of studies (Agrawal and Knoeber, 1996; Bhagat and Black, 2002; Hillier et al., 2005; Andres and Vallelado, 2008). A firm whose Q is ≥ 1.0 is considered to have a market value higher than the value of the firm's book assets. This explains why some firms' assets may not be recorded. Goyal (2005) documents that economic rents generated from a valuable charter or franchise value are capitalised in the market value of the banks' assets (but not in the book value). The author also indicates that the demand deposit ratio is an alternative measure for charter bank value, which proxies the market power resulting from deposit markets. Adopting Keeley (1990) and Caprio's et al. (2007) method Q is estimated as follows in equation (3.2):

Q=(market equity value + book value of debt)/Total assets[40].....(3.2)

Caprio et al. (2007) analyse the impact of shareholders protection laws and ownership structures on the highest valued publicly listed banks from 44 countries, as defined by the total assets at the end of 2001. They highlight that a stronger legal protection of minority shareholders is related to greater bank performance. They also note that the expropriation of minority shareholders is crucial for banks in many countries, whilst legal mechanisms restrict the expropriation of bank resources.

Total Capital Adequacy Ratio: It is defined as the sum of Tier 1 and Tier 2 capital divided by the total risk-weighted assets and is denoted as CART. This ratio captures whether a bank is well capitalised, adequately capitalised, under-capitalised, or critically under-capitalised. A bank is considered to be well capitalised by FDIC if its total risk assets ratio is ≥ 10%, or more than 10% of risk-weighted assets, and the tier 1 risk assets ratio is ≥ 6% (Elyasiani and Jia, 2008; Flannery and Rangan, 2008).

A. Risk Measures

The fundamental risk proxies used in this thesis are the bank balance sheet risk characteristics and, leverage annual stock-return volatility. These risk measures were widely used in several research works (Saunders et al., 1990; Gorton and Rosen, 1995; Flannery and Sorescu, 1996; Martinez-Peria and Schmuckler, 2001; Demirgüç-Kunt and Huizinga, 2004; Konishi and Yasada, 2004; Coles et al. 2006; Laeven and Levine, 2009). As such, the dependent variable is a risk measure - either accounting-based or market-based indicators. However, accounting risk proxies are perceived to be unbiased and precise proxies for firm financial condition and viability (Gorton and Santomero, 1990). Market stock return volatility measures the total variability in stock returns and it reflects the perceptions of the market over bank risks associated with both on- and off-balance sheet exposures (Demsetz et al., 1997).

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[40] A large part of debt is composed of customers' core deposits, as these are the major sources for banks cash flows (Diamond, 1984).

Z-score is an overall bank risk proxy. It is calculated by taking the total returns on assets plus capital asset ratio divided by the standard deviation of asset returns. (Laeven and Levine, 2009; Pathan, 2009). Practically, regulatory bodies pay a close eye on the banks' overall risk measures. Leverage (debt ratio) is defined as the total debt divided by total assets. It is expected that risk is positively related to leverage (Lev, 1974; Saunders et al., 1990): and highly leveraged banks usually show greater stock return volatility and lower capital ratio – leading to higher default likelihood in bad times.

B. Control Variables

Many control variable specifics that might influence bank risk-taking levels are mainly selected based on prior research. These variables include asset size, leverage, market-to-book, and return on assets. Firm size (LNSIZE) is defined as the natural log of book value of firm's assets. Larger banks relative to small ones (i.e., vulnerable to higher credit risk likelihood) are perceived as safer - as they can diversify their asset portfolio risk, are better managed, have lower probability of failure or can enjoy federal bailout schemes (Saunders et al., 1990; Cebenoyan et al., 1995; Flannery and Sorescu, 1996; Sironi, 2003; Akhigbe et al., 2007). Yet, larger banks are more liquid and have relatively lower information asymmetry. The bank asset size also measures growth opportunities. Hence, these effects suggest that the direction of asset size (i.e., sign on the coefficient) depends on the type of risk this variable is regressed on (Demsetz and Strahan, 1997).

Return on assets (ROA) captures the earnings of a bank. Risk is expected to be positively associated with higher earnings, a reflection of compensation for higher risk-taking (Flannery and Sorescu, 1996). On the other hand, it indicates the presence of monopoly or management efficiency as risk measures are predicted to be negatively related to ROA. Market value to book value ratio (MTB) is defined as market value of common stock over book value of common stock. It measures the value of growth investment opportunity sets (Smith and Watts, 1992) and as Tobin's Q it also captures the charter value of the bank (Keeley, 1990). Risk is predicted to be negatively associated with MTB, suggesting lower default probability in higher charter value banks.

3.4 Summary of Statistics for the Entire Sample

Table 3-2 contains the key descriptive statistics for ownership and board structure over the period 2000-2005. The average mean values of managerial ownership reveal a mixed pattern. They increased from 16% in 2000 to 17% in 2002 fell to 16% in 2003, then to 14% in 2005. This pattern might be attributed to consolidation in the banking industry subsequent to the Glass-Steagall Act relaxation. The pooled mean value of this variable is 16%. These values are considerably higher than those of 5.77% and 13.857%, reported by Booth et al. (2002) and Elyasiani and Jia (2008), respectively. Median values were quite below the average mean values. The range is between 0% and 87%. Elyasiani and Jia (2008) report a range of 0.534% to 98.65%, which is reasonably close to that found in this investigation. It may be argued that these differences are attributable to defining managerial ownership to take directors into account (Agrawal and Knoeber, 1996).

Average mean and median values for the percentage of CEO ownership depict steady trends of 4% and 2% over the entire period, respectively. Booth et al. (2002) and Linck et al. (2008) reported mean values of 8.97% and 6.07% for CEO ownership in industrial firms, respectively. These patterns suggest that insiders in the banking industry hold lower equity stakes than industrial firms do. This might be explained by the existing regulations that restrict the level of ownership of bank insiders at a certain percentage of core capital (tier 1), as well as by nosier environments, which precipitate higher agency costs (Demsetz and Lenn, 1985). The average mean values for the percentages of institutional ownership show a mixed pattern, with a pooled value of 15%, which is lower than that of 27.60% reported by Elyasiani and Jia (2008). Similarly, the medians for the percentages of institutional ownership are far below the means. The range is 0% to 96%, whereas Elyasiani and Jia (2008) report a range of 1.299% to 81.435%. This variation could be attributed to the proliferation in number of these institutions investing substantial equity stakes in corporate banks as pointed out by Elyasiani and Jia (2008).

Previously, fewer institutions owned a smaller fraction of bank stocks (Adams and Mehran, 2003). However, institutional investors are the largest shareholders in bank holding companies today (i.e. with a maximum shareholding around 96% in my sample held in SVB Financial Group). With this pattern, one would argue that regulatory reforms, financial products and services, market innovations, and advancement in technological developments influenced institutional investors to shift investing more in banking firms. The average mean values for the percentages

of blockholder ownership also show a mixed pattern. However, the range is 5% to 96%, which implies a higher ownership concentration for banking firms. It is apparent that blockholders ownership is estimated as the percentage of shares held by institutions or individuals with greater than or equal to 5% ownership of the outstanding shares.

Institutional investors are the largest blockholders in banking firms. With this huge wealth capital investment, it may be logical that institutional investors should have greater incentives to shape bank managerial behaviour as noted by Shleifer and Vishny (1986) for corporate firms. In fact, their ability to discipline corporate behaviour may be affected by both investment agenda and horizon. For instance, there are times when institutional investors hold shares for a long-term (stable shareholders) or a short-term motive. With this opposing incentive, institutional investors can drive managers to boost corporate performance or self-serving behaviour.

The mean and median values for board size show a slight decreasing trend (see Figure 3-1), with pooled values of 12 and 11, respectively. These values are higher than those reported in industrial firms by Linck et al. (2008) for the period 1990-2004. In fact, Adams and Mehran (2005, p. 4) provide evidence that, “the proportion of outsiders in BHCs and the size of the board are large compared … [with] manufacturing firms”. The range is from 4 members (i.e. in the Macatawa Bank Corporation and Eagle Bancorp) to 33 members (in United Bancorp). This range is lower than that of 8 to 36 board members found by Adams and Mehran (2008) in the US’s BHCs for the period 1986-1999. This variation was triggered by the mergers of the 1980s, which brought in a large number of M&As in to the banking sector (Gorton and Rosen, 1995; DeLong and DeYoung, 2007). In this sample, therefore, the decreasing pattern in board size can be explained as follows: One, the pace of merger and acquisition wave of large BHCs declined relatively over the period considered. Two, following the arrival of the strong Sarbanes-Oxley Act (2002) and complexity of banking business, there is a sense that individuals nominated to join bank boards are hesitant to avoid being held accountable in case things go wrong.

The percentage of independent directors is so significant with respect to the composition of boards and rose from 2002. The average values show an upward trend from 75% (2002) to 77% (2005). These values are higher than those of 69% and 58% reported by Booth et al. (2002) and Adams and Mehran (2008),

respectively. Indeed, since 2002, figure 3-2 exhibits the stylised fact of the increase in the percentage of independent directors in the board composition: with the provisions under the Sarbanes-Oxley Act (2002) and regulations at other US major exchanges, reformed boards are largely composed of independent directors.

Overall, board size slightly went down, whilst independent board composition reversed to an upward swing. The Sarbanes-Oxley Act (2002), as well as amendments to the NYSE and the NASDAQ, contributed to this behaviour in board structure (Linck et al., 2008). Additionally, board size in banks is influenced by the structure of the boards of the BHC's lead and subsidiary banks (Adams and Mehran, 2002). Intuitively, these patterns entail that most bank firms are adjusting towards greater board independence. This is consistent with the recent prominence of corporate governance reforms, and Basel II's emphasis on corporate governance and risk management in financial institutions.

Average values for the CEO-Chair position, SPLIT, declined from 49% in 2000 to 47% in 2002, and then remained static until 2005. Taken as a whole, less than 50% in my sample are dual CEO-Chair banks. This supports the view that the extent of regulation in banks reduces the importance of CEO-Chair governance in mitigating agency costs and enhancing performance (Brickley et al., 1997; Booth et al., 2002). Booth et al. (2002) pointed out that the percentage of CEOs serving as chairpersons of the board is 80% in a cross-section; which is higher than the 50% found in my sample.

Table 3-3 presents descriptive statistics for the CEO cash-based and equity-based compensation. Cash compensation for CEOs has displayed a mixed declining pattern. In mean values, it exhibited a downward trend from $0.65 million in 2000 to $0.59 million in 2002, before it increased to $0.85 million in 2005. The upward trend over the period from 2003 through 2005 is consistent with and can be explained by the recent rise in bankers' pay – i.e. especially in bonuses. Virtually, this finding adds to an earlier study - i.e. Houston and James' (1995) who claim that the average cash received by bank CEOs is declining. The average, mean and median values for total compensations of CEOs show mixed patterns. They decreased from $14.2 million in 2000 to $12.5 million in 2002, before rocketing to $18.5 million in 2004, with a slight decrease to $17.70 million in 2005. The range is $0 to $1.21 billion. These values are higher than those reported by Bliss and Rosen (2001). Perhaps this is due to the definition used, sample period differences, and

the regulatory environment change which opened opportunity investment sets for banks.

The CEO stock ownership-based compensation showed an increasing trend. The mean values increased to $16.30 million in 2005 from $12.80 million in 2000. For comparability, the mean value of the CEO stock option-based compensation indicated a mixed pattern. It decreased from $1.05 million in 2000 to $0.85 million in 2003 before trending to $1.02 million in 2005. The mean pooled value of CEO stock option is $1.03 million. Its range is $0 million to $36.30 million. This distance compares with a range of $0 million to $36.055 million reported by Chen et al. (2006) in commercial banks.

The overall CEO total equity-based compensation drifted up from the mean values of $13.5 million in 2000 to $16.80 million in 2005. The trend indicates that the dollar value of stock ownership and stock options granted increased significantly *ex-post* deregulation as before - i.e. Gramm-Leach-Bliley Act of 1999 enactment. This behaviour is supportive of findings by Chen et al. (2006) and Vallascas and Hagendorff (2010). However, an earlier study by Houston and James (1995) reports that bank executives received insignificant amounts in stock option compensation. The intent of deregulating the financial sector was to create a more competitive environment and increase the scope of investment opportunity set for depository institutions. With this growth in equity-based compensation position in mind, managers would have had higher incentives to take on newly available opportunities by investing in valuable risk-increasing projects.

Table 3-4 presents the descriptive statistics for different types of assets, liabilities, assets quality, and capital quality. The average mean values for total assets are driven by earning assets-risk assets, in particular, loans, and show an interesting pattern of increase. This suggests that the changing regulatory environment drives growth in assets and increased bank lending. The average mean value of bank assets increased from $14.42 billion in 2000 to $24.82 in 2005. Median values indicate similar behaviour to mean values. Sample selection involved banks of varying sizes as evidenced by a range of $0.01 billion to $1,494 billion. In general, the total assets pattern is consistent with that found in previous studies (Adams and Mehran, 2003; Elyasiani and Jia, 2008; Flannery and Rangan, 2008). The customers' deposits are the foremost component of banks' liabilities that contribute towards leveraging banks. The average mean values and the median values of liabilities both show upward trends, as is the case with assets.

The message gathered is that the assets side proportionately increased along with the liabilities side of the balance sheets. That is compared to industrial firms; volatile bank deposit sources fund asset risk and loan growth. The size of bank assets is important and affects risk-taking incentives as large banks are better diversified relative to smaller ones (Demsetz and Strahan, 1997).

The distributions of some selected asset quality indicators include the non-performing loans to reserve loans loss ratio and the non-performing loans to total loans ratio. Reserve loan loss ratio refers to the amount of cash set aside to cover problem charged-off loan losses. Non-performing loans ratio refers to a credit facility whose contractual repayment is 180 days or more over due or not accruing interest, and it is defined as non-performing loans to total loans. Non-performing loan ratio measures the risk of a bank credit portfolio. As statutory reserve capital, the reserve loan loss account has to be replenished once its balance falls. Essentially, this is created mainly to accommodate the increased provisions for loan losses made by banks on a regular basis. That possibly means that the substantial loan charge-off losses are potential losses on the bank's equity portfolio - i.e. it impairs bank capital status (BCBS, 2004). This occurs when the charged-off losses are not fully absorbed in the allowance for loan losses account.

In this perspective, it seems that the banks' equity capital position may be in danger - i.e. most likely a bank heading to insolvency. Subsequently, this may call for substantial capital injection for ensuring stability and good prospects in a bank. On the other hand, it may be logical that as bank loans are informationally opaque, therefore, these indicators may suffer manipulation that can drive positive net income[41]. However, the reserve loan losses account is determined by the magnitude of the loan portfolio and its risk profile. It is worth noting that the analysis reveals that both risk indicators display patterns of decrease over the entire period. While the mean values of non-performing loans to the total loans ratio declined to 0.59% (2005) from 0.86% (2000), the mean values of non-performing loans to reserves loans loss ratio decreased to 58.03% (2005) from 65.90% (2000). These

[41] The recent high bank profile cited in the manipulation fraud is of the collapsed Lehman Brothers investment. With insufficient corporate disclosure, the Lehman manoeuvred its balance sheet by using an accounting technique known as "Repo 105" to increase profitability while hiding insolvency signals. Surprisingly, the bank was well capitalized, suggesting that its failure was more of poor governance rather than regulatory recklessness (see Editorial: *The Lesson from Lehman's Failure* - Mar-12).

trends imply a good quality of credit portfolio. In other words, it suggests probably that there are tight prudential regulations on risk management articulated in asset and capital restriction guidelines.

Although to date there is no established benchmark for the above credit portfolio risk ratios, it is apparent that good or minimum risk indicators (i.e., reserve loan losses and non-performing ratios) must be trending down over time. From this context, the credit default rate and the expected cash flows have to decrease and increase, respectively. These changes in the asset portfolio can explain improvement in banks' liquidity positions. Extreme maximum values of reserve loans losses and the non-performing loans ratios reported in 2000 and 2001 may have two elucidations: First, that these signals reflect corporate scandal and failure episodes over that period. Second, the impact of the deregulatory banking environment - through Riegle-Neal Act of 1994 and Gramm-Leach-Bliley Act of 1999 were in part attributed to excessive contractual risk-taking incentives. The mean values of risk measures significantly trended down during the period 2003-2005. The Sarbanes and Regulation A in the 2003 reforms can be highlighted as drivers of keeping these risk measures down. That means, many banks should have complied with and adopted the regulatory requirements.

Average mean and median values of both capital adequacy ratio tier 1 and the total capital adequacy ratio distributions, showed mixed patterns. It is also interesting to note that their average mean values are above the benchmark ratios of 6% and 10% (complied with FDIC requirements), respectively. The range for the total capital adequacy ratio tier 1 is 7.20% to 54%. Overall, the US's bank holding companies were well capitalised over the period investigated, suggesting that they were less susceptible to credit default risks. In other words, the well capitalised pattern (low leveraged) mirrors low bank risks. However, based on the above asset quality and capital adequacy patterns, it is difficult to reach an appropriate conclusion on the status of these banks due to asymmetric information.

Table 3-5 shows the distribution of the bank performance using accounting and market information. Average mean and median values for returns on assets depicted an increasing pattern. These values are close to those of 0.9% reported by Adams and Mehran (2003), and 1.209% by (Elyasiani and Jia, 2008). The minimum is -10.5% and the maximum is 6.48%. A negative minimum implies that some banks realised losses in some periods. Moreover, a similar trend is noted in the return on equity. The market capitalisation indicates comparable behaviour to

that of assets. The average mean values in Tobin's Q (Q) depicted a mixed trend. The median values are very close to the mean values, implying a symmetric distribution. The q value in a pooled sample is 1.08, close to those of 1.1 reported by Adams and Mehran (2003); 1.02 reported by Andres and Vallelado (2008) in Canada, Italy, France, UK, US and Spain, Caprio et al., (2007); and 0.94% reported by Goyal (2005).

The mean and median values of Q are greater than 1, pointing out the rather high BHCs charter values over that period. In this case, the increasing patterns in the performance - positive return indicators (ROA or ROE) are preferred. The losses revealed on some of these indicators have got a direct linkage with the above risk proxies. The overall, performance accounting measures show a mixed trend characterised by loss and/or profit. This could be driven by weak credit management, unsound corporate governance and poor stock-market performance in some of the banks. But, the bank market value and profitability were better over this period.

3.5 Descriptive Statistics – Sorted by Total Assets

This section discusses and analyses the key descriptive statistics for corporate governance variables and firm-level characteristics sorted on a total assets basis. The sample is divided into five (5) groups – each quintile of 20%. The size grouping was done in order to ascertain whether there are any more interesting patterns to contrast with those discussed in Section 3.4. Q1 quintile and Q5 quintile represent firms with the lowest values and highest values of total assets respectively. Q3 is the cut-off point quintile. Q2 and Q4 come before and after Q3, representing 40% of the total distribution. While the largest banks focus on the regulatory agencies, small banks may be disproportionately affected by the regulatory reforms - i.e. Basel II & III, mandatory sub-debt issuance regulation and bankers pay schemes and bank governance.

Table 3-6 provides descriptive statistics for ownership and board structure variables on a quintile-basis in Panel A and B, respectively. In analysing banks with the lowest total asset values, CEO ownership had the mean values of 4% in both Q1 and Q2. It then increased to 5% in Q3, and went down to 2% for banks with the highest total value assets in Q5. The range is 0% to 51%. Similarly, in examining firms with the lowest total asset values (Q1), the mean value of the percentage of

managerial ownership was 21%, which is higher than that of the banks with the highest total asset value (Q5), which recorded 8%. The range is 0% to 72%.

In general, it is very interesting to note that all average mean values for CEO and managerial ownerships are very high in banks with the lowest total asset values, and relatively low for banks with highest total assets values. This can be viewed as a consequence of the fact that publicly traded small banks are not subject to the tight regulatory conditions that large banks are. It is likely that stringent regulatory monitoring devices bar insiders in large banks from holding substantial equity stakes. As Cole and Mehran (1998) show, restrictions on stock ownership can impair bank performance, and La Porta et al., (2000) have argued that Glass-Steagall regulations constrain bank ownership. The percentage of institutional ownership and the percentage of blockholder ownership display similar mixed statistical patterns. The pattern is supportive of the view that institutional investment decisions depend on the attractiveness of firms, in terms of their book value of assets, or their listing in a reputable stock exchange, such as NYSE (Agrawal and Knoeber, 1996).

The separation of the CEO/Chair position shows an average mean value of 28% in banks with low total asset values (Q1), in comparison to 71% in banks with higher total assets values (Q5). The interpretation of this is that there is a higher likelihood of transparency and tight regulations in larger banks than in smaller ones. Tenure also displays an increasing pattern from Q1 through Q5, but is most significant in Q3. Thus, the CEOs located in Q3 banks are likely to stay longer than those in small and large ones and have a higher likelihood of tenure renewal. Stated in a different way, CEOs who outperform have longer tenure periods (Brickley et al., 1997; Mak and Li, 2001). The average mean values of board size shows an increasing pattern from small banks with low total asset values (Q1) through to large banks with higher total asset values (Q5). The board size progressively increased from 10.39 (Q1) to 15.39 in (Q5). This pattern is consistent with predictions and supports the view that large and highly leveraged firms need larger boards and more advice (Coles et al., 2008).

It is worth noting that the analysis of both a fraction of independent directors and a percentage of outside directors has revealed mixed distributions and patterns of decrease. Both variables are higher in banks with lowest asset values (Q1) than in those with the highest total asset values in Q5. However, the variations are not significant enough to affect the interpretation, despite the fact that the size of the

banks and changing environment can influence bank boards. Interestingly, the board composition in all quintiles (Q1-Q5) is dominated by independent directors (i.e., mean >=72% of board size). These trends are compatible with the SEC, NASDAQ, and NYSE requirements (Linck et al., 2008). Thus, firm size (i.e. including market capitalisation) is one of the determinants of board structure. Furthermore, the role of the board of directors, from the banking perspective, is underscored by Basel Committee on Banking Supervision.

Table 3-7 reports the summary statistics for the compensation of CEOs. The average mean values for CEO stock ownership, stock options and total equity-based compensation all display a pattern of increase from Q1 to Q5, as do the cash-based and total compensations. For instance: stock ownership increased from $0.83/ln13.63million in Q1 to $44.30/ln17.61 million in Q5 as do stock options that rose from $0.04/ln10.66 million in Q1 to $4.11/ln15.23 million in Q5. This trend is true for the total equity based compensation that depicted the same pattern. This pattern provides insight that CEOs pay is substantial at larger banks.

Across all the structure of compensation contracts, the dispersion in the structure of compensation contract designs for CEOs trended up from Q1 through to Q5. The most obvious explanation for this pattern is that executives in banks with the lowest total asset values are less well compensated than their peers in complex banks. In other words, bankers' pay in larger banks is more substantial in comparison to smaller or medium banks. Thus, these patterns are consistent with the prediction of contracting and firm-size views. To support the above behaviour in CEO compensation, Murphy (1999) provides the following stylized facts: Firstly, in large firms, pay levels are higher and pay-performance sensitivities are lower. Secondly, levels of pay-performance sensitivities are lower in regulated utilities than in industrial firms. For instance, Smith and Watts (1992) document systematic differences in managerial compensation across firm size and with the availability of the firm's investment opportunity sets.

Table 3-8 reports some summary statistics for liabilities, asset quality and capital quality. Banks with the lowest total asset values (Q1) had a low average mean value of loans ($0.19/ln$19.06 billion), as expected. In large banks (Q5), the mean value of loans – i.e. the largest component of total assets – is higher ($43.51/ln$24.5 billion). Similar behaviour holds true for the total of liabilities and deposits. The total deposits in Q1 are the lowest ($0.23/ln$19.25 billion) and are the highest in banks with the greatest total assets in Q5 ($47.90/ln24.59 billion).

Intuitively, asset and liability patterns imply that large banks attract considerable deposits from all groups of customers, particularly the corporate ones. This means that they are, systematically, more highly levered than small banks, which is consistent with the deposit insurance theory (Boyd and Runkle, 1993). In addition, banks located in Q5 are prominent in terms of their long-term ties with corporate customers (Blackwell and Drew, 1997; Dewenter and Hess, 1998). Their reputation, compliance with bank regulations and capital markets requirements could also have precipitated the attraction of more deposits.

The trend of capital adequacy tier 1 and the total capital adequacy ratios depicts a declining trend from banks with the lowest total asset values in Q1, through to those with the highest in Q5. Nevertheless, all the banks were well capitalised as, on average, they held more than 10% of the risk weighted assets. The higher ratios in banks with the lowest total assets can be viewed as incentives to pursue risky investments choices through moral hazard – i.e. risky loans and real estate investments. In other words, their capital positions are sufficient to buffer unexpected economic shocks vulnerable to their asset portfolios. The average mean values of non-performing loans to total loans ratio showed mixed behaviour, as did the non-performing loans to reserves loans losses indicator. This means that the average amount of cash provided to cover problem loans displayed a proportionate pattern from Q1 through Q5 banks. Intuitively, banks with poor loan portfolios set aside a proportional hedging cash fund for both expected and unexpected losses. Given this trend, it is not easy to offer a direct conclusion that banks in Q1 had poor loan portfolios, and hence larger reserve loan loss positions.

Table 3-9 presents the key summary statistics for firm performance measures. Banks in the lowest quintile (Q1) had the lowest mean value for returns on asset (1.02%). This pattern increases as the quintile distribution increases through to Q5 (at 1.70%). The standard deviations are very small and the range is from -10.55% to 0.29%. Likewise, the returns on equity depicted the same trend as that reported in the return on assets. Both ratios trended up from Q1 through to Q5. This is consistent with findings that larger banks are better diversified than smaller ones (Saunders et al., 1990; Demsetz and Strahan, 1997; Flannery and Sorescu, 1996; Sironi, 2003). According to Flannery and Sorescu (1996, p. 451), larger banks tend to have more diversified portfolios and ultimately benefit from too-big-to-fail policy. Under this doctrine, all large banks deposits are *de facto* guaranteed (Boyd and Runkle, 1993).

Banks in Q1 show the lowest mean value of market capitalisation. This is true for Q1 through to Q5, supporting the view that large firms regularly trade in capital markets. Variations in market capitalisation are relatively small, which explains the low stock-return volatility in stock prices. The q values of average mean values increased from Q1 through to Q5, which is consistent with the hypothesis that banks with low q values have greater incentives to engage in risky lending activities (Keeley, 1990; Goyal, 2005). Generally, it is worth noting that all accounting and several market performance measures had lower mean values in banks with low total asset values than in banks with high total asset values. Moreover, the performance and asset quality of banking firms highlighted upward trends.

3.6 Descriptive Statistics - Sorted by Tobin's Q

In order to provide a more rigorous analysis, a bank behaviour data sample was sorted using Tobin's Q as a basis. The sample is divided into five (5) groups, 20% of each quintile, as in Section 3.5, and more interesting patterns were ascertained. Appealing patterns and moderately higher descriptive statistics values are reported on Tobin's Q sorts. This is mainly because q takes into account the efficient market hypothesis and valuable bank charters. Generally, as with the total assets sorting, Tobin's Q ranking portfolios preserved consistent patterns of the characteristics of ownership, board and compensation and firm. Their descriptive statistics are qualitatively identical to those reported by sorting according to the asset size grouping technique. In this perspective of analogous behaviour, tables of descriptive statistics results associated with Tobin's Q ranking-basis are not reported; instead the main findings are highlighted in the next section.

3.7 Summary and Conclusions

This chapter began by analysing and discussing descriptive statistics for corporate governance and firm-level variables in a sample of 301 banking firms during the period 2000-2005. Then, it constructed a number of proxies that are used empirically in Chapters 5 and 6. The analysis of the descriptive statistics focused on a pooled sample sorted by both total assets and Tobin's Q. In the initial analysis, some important findings were outlined.

First, in a pooled sample, CEO ownership showed a similar pattern to previous studies. Institutional ownership showed fluctuating patterns in terms of the mean

(median) values. However, the number of institutional investors in banking firms is increasingly relative as before. Second, board governance characteristics indicated a mixed trend. While board size decreased, the proportion of independent directors increased over the period investigated. Third, the bank characteristics – i.e. total of assets, loans, deposits and liabilities showed upward patterns and are consistent with previous researchers (e.g. Adams and Mehran, 2003; Elyasiani and Jia, 2008). Asset quality indicators imply improvement in quality of credit portfolio. The total capital adequacy ratios are within the benchmark of regulators, implying that, on average, banks are well capitalised to absorb risk and unexpected losses. Measures of performance indicated mixed behaviour, although they were dominated by good performance.

Fourth, sorting by total assets and Tobin's Q highlighted interesting patterns. Generally, the mean values of these characteristics increased from Q1 (for low banks) through Q5 (for large banks). Throughout this sorting technique, banks with the highest quintiles reveal much larger values in Q5s - i.e. ownership, boards, compensation, and firm characteristics. The possible explanations to this behaviour may go as follows: One, large bank holding companies located in Q5 are well diversified, regardless of being largely dominated by risky assets, have relatively less information asymmetry, and have relatively good governance. In fact, banks located in Q5s have larger boards dominated by independent directors. This positive relationship between both board size and the proportion of independent directors on asset size is important to bank behaviour. It is supportive of the conventional view that larger boards are both better monitors and advisors (Dalton et al., 1999), and consistent with the notion that more outside representation on boards can result in improved efficient monitoring.

Two, CEOs of large and complex banks (in terms of asset size and higher q-values) are highly compensated compared to CEOs of smaller banks who are yet competing to turn their banks into larger ones. This is consistent with the contracting theory that large firms reward their executives highly. Three, banks with the highest quintiles indicate the highest values of the total assets, loans, deposits, and liabilities. This means that the largest banks, in terms of total assets and market capitalisation, attract huge volatile deposits and offer greater loans to corporate businesses. Generally, it is very hard to draw a strong conclusion for this initial analysis and intuition, however. Empirical chapters 5 and 6, therefore,

capitalise on this unearthed analysis in the quest to find whether corporate governance of banks is relevant to risk-taking.

Table 3-1 Summary in selecting the final sample

BHCs as at September 2006 (in BSC)		445
Less:	Savings Institutions	124
	Security brokers, dealers & flotation companies	2
	Real estate investment trusts	1
	Mortgage bankers, & loan correspondents	3
	Miscellaneous business credit institution	1
	Life Insurance	2
	Money Centre/finance services	1
	Commercial banks, not elsewhere classified (NEC)	1
	Banks with annual proxy statements on SEC, but notable amount of missing financial observations	36
	Banks with no annual proxy statements on SEC	18
	Sub-Total	189
Add:	Recollected direct from SEC	45
Final sample (SIC: 6021 & SIC: 6022)		**301**

Table 3-2 Descriptive statistics for ownership and board structure

This table reports some summary statistics for ownership and board structure extracted from the proxy statements; DEF-14A forms. The data sample is 301 and data period analysed is from 2000-2005. It shows the observations, mean value, median value, standard deviation value, and minimum and maximum value (s) in column one. Managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors. The variable CEO ownership is as the percentage of shareholdings by the CEO based on shares outstanding. Outside independent ownership is defined as fraction of equity to common equity shares owned by directors without any family/financial relationship to the firm. Institutional ownership variable is defined as percentage of ordinary shares held by institutional investors based on common equity shares under voting control. Blockholders ownership is a percentage of shares held by institutions or individuals with greater than or equal to 5% ownership of the shares outstanding. CEO-Chair split is a dummy variable equals to 1 where chairman is also the CEO, or otherwise 0. CEO tenure is the number of years served by the CEO. Board size is total number of board of directors on board. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size.

	Panel A: Ownership Structure													
	Managerial Ownership (INSOWN)							CEO ownership (CEOWN)						
Year	2000	2001	2002	2003	2004	2005	Pooled	2000	2001	2002	2003	2004	2005	Pooled
N	282	292	300	298	297	297	1,766	270	284	292	290	287	286	1,709
Mean	0.16	0.17	0.17	0.16	0.15	0.14	0.16	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Median	0.11	0.12	0.12	0.11	0.11	0.10	0.11	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Std	0.14	0.14	0.14	0.14	0.14	0.13	0.14	0.08	0.07	0.07	0.07	0.07	0.07	0.07
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	0.87	0.82	0.79	0.78	0.75	0.68	0.87	0.51	0.47	0.45	0.47	0.48	0.47	0.51
	Institutional ownership (INSTOWN)							Blockholders ownership (BLOCK)						
N	138	135	151	150	162	169	905	209	220	229	227	233	230	1,347
Mean	0.15	0.15	0.16	0.15	0.14	0.14	0.15	0.23	0.23	0.24	0.23	0.21	0.22	0.23
Median	0.11	0.11	0.11	0.11	0.10	0.11	0.11	0.15	0.16	0.17	0.16	0.16	0.16	0.16
Std	0.14	0.15	0.16	0.13	0.12	0.12	0.14	0.17	0.18	0.19	0.18	0.17	0.18	0.18
Min	0.03	0.03	0.03	0.00	0.01	0.01	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Max	0.93	0.92	0.96	0.89	0.89	0.91	0.96	0.93	0.92	0.96	0.89	0.89	0.95	0.96

	Panel B: Board Structure													
	CEO-Chair (SPLIT)							CEO tenure (TENURE-years)						
Year	2000	2001	2002	2003	2004	2005	Pooled	2000	2001	2002	2003	2004	2005	Pooled
N	282	292	300	290	297	297	1,766	256	270	279	276	277	277	1,635
Mean	0.49	0.49	0.47	0.47	0.47	0.47	0.48	8.61	8.61	9.40	9.89	10.18	10.44	9.54
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.50	7.00	7.50	8.00	8.00	7.00
Std	0.50	0.50	0.50	0.50	0.50	0.50	0.50	7.54	7.53	7.85	8.04	8.25	8.24	7.94
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	44.00	45.00	46.00	47.00	48.00	49.00	49.00
	Board size (BDSIZE)							Fraction of independent directors (FINBD)						
N	282	292	300	298	297	297	1,766	282	292	300	298	297	297	1,766
Mean	12.38	12.24	11.92	11.87	11.90	11.69	12.00	0.76	0.75	0.75	0.76	0.77	0.77	0.76
Median	12.00	11.00	11.00	11.00	11.00	11.00	11.00	0.79	0.78	0.79	0.79	0.80	0.79	0.79
Std	4.73	4.60	4.23	407	4.77	4.59	4.18	0.15	0.15	0.15	0.13	0.13	0.12	0.14
Min	4.00	4.00	4.00	5.00	5.00	4.00	4.00	0.20	0.22	0.22	0.40	0.33	0.33	0.20
Max	30.00	31.00	32.00	33.00	32.00	33.00	33.00	0.96	0.96	0.96	0.95	0.94	0.94	0.96

Table 3-3 Descriptive statistics for compensation of CEO

This table reports a summary statistics of compensation for CEO and executive officers extracted from the proxy statements; DEF-14A forms. The data sample is 301 and data period analysed is from 2000-2005. It shows the observations, mean value, median value, standard deviation value, and minimum and maximum value (s) in column one. Stock ownership compensation value to CEO, labelled as CEO-STOCK. Black-Scholes value of stock options compensation to CEO, labelled as CEO-OPT. Total equity-based compensation to CEO which includes common stock value and Black-Scholes value of stock options, labelled as CEOEB. Cash compensation is the summation of annual bonus and salary compensation to CEO, denoted as CEO-CB. Total compensation is the summation of cash-based, stock ownership and stock options values, denoted as TC. All figures are US$ in millions.

	Stock ownership (CEO-STOCK)							Stock option (CEO-OPT)						
Year	2000	2001	2002	2003	2004	2005	Pooled	2000	2001	2002	2003	2004	2005	Pooled
N	267	279	291	289	289	287	1702	143	145	160	149	156	141	894
Mean	12.80	12.80	11.40	14.60	17.30	16.30	14.20	1.44	1.05	0.87	0.85	0.95	1.02	1.03
Median	0.71	1.03	1.12	1.89	2.34	2.25	1.48	0.12	0.12	0.12	0.13	0.16	0.21	0.14
Std	77.80	74.40	51.50	44.00	47.90	41.30	57.40	4.50	2.55	2.09	1.88	2.56	2.43	2.78
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	1,190.00	1,160.00	802.00	465.00	505.00	285.00	1,190.00	36.30	19.70	17.50	11.20	20.40	18.00	36.30
	Total equity compensate (CEOEB)							Cash Compensation (CEO-CB)						
N	267	279	291	289	289	287	1702	280	291	298	296	295	295	1755
Mean	14.50	14.40	11.90	15.00	17.80	16.80	14.80	0.65	0.65	0.59	0.63	0.74	0.85	0.69
Median	0.84	1.18	1.34	2.02	2.45	2.36	1.67	0.30	0.33	0.37	0.37	0.40	0.43	0.37
Std	78.00	74.70	52.10	44.40	48.30	42.00	57.80	1.54	1.33	0.80	1.04	1.23	1.73	1.31
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	1,190.00	1,160.00	809.00	467.00	505.00	286.00	1,190.00	19.50	18.00	8.00	10.90	8.86	24.70	24.70
	Total compensation (TC)													
N	267	279	291	289	289	287	1702							
Mean	14.20	14.00	12.50	15.60	18.50	17.70	15.50							
Median	1.25	1.73	1.89	2.45	2.87	2.92	2.10							
Std	79.20	75.80	52.30	44.60	48.70	42.40	58.40							
Min	0.09	0.00	0.00	0.00	0.00	0.00	0.00							
Max	1,210.00	1,180.00	810.00	468.00	506.00	288.00	1,210.00							

Table 3-4 Descriptive statistics for assets, liabilities, assets quality, and capital quality

This table reports some summary statistics for assets, liabilities, assets quality, and capital quality extracted from Worldscope database-Thomson One Banker. The data sample is 301 and data period analysed is from 200-2005. It shows the observations, mean value, median value, standard deviation value, and minimum and maximum value (s) in column one. The data sample consists of book value of total asset comprising earning assets and non-earning assets. Total loans variable labelled include personal, commercial and mortgage loans. Total deposits variable is the summation of savings, time and demand deposits. Total liabilities variable include total deposits and other liabilities. Non-performing Loans reserves loans losses ratio is defined as Non-performing Loans divided by reserves loans losses. Non-performing loans to total loans ratio variable is defined non-performing loans divided by total loans. Capital adequacy ratio tier 1 is calculated as tier 1 capital divided by weighted risk assets and Total capital adequacy ratio variable is defined as the sum of Tier 1 capital and Tier 2 capital divided by weighted risk assets.

	Total Assets (TA) in US $ Bill							Total loans in US $ Bill						
Year	2000	2001	2002	2003	2004	2005	Pooled	2000	2001	2002	2003	2004	2005	Pooled
N	298	300	300	301	301	301	1,795	295	300	300	301	300	299	1,800
Mean	14.42	15.72	16.90	18.51	22.83	24.82	18.96	7.54	7.72	8.22	8.91	11.05	12.21	9.25
Median	0.79	0.86	0.97	1.09	1.28	1.44	1.07	0.56	0.60	0.66	0.72	0.88	0.99	0.71
Std	79.65	85.83	91.17	101.21	131.27	139.64	107.47	36.45	36.00	38.90	42.06	54.08	58.37	45.09
Min	0.01	0.02	0.04	0.06	0.08	0.09	0.01	0.02	0.00	0.02	0.04	0.05	0.06	0.00
Max	902.21	1,051.45	1,097.19	1,264.03	1,484.10	1,494.04	1,494.04	392.19	391.93	447.80	478.01	548.83	583.50	593.50
	Total liabilities in US $ Bill							Non-performing loans to total loans ratio (NPLTL %)						
N	298	300	299	301	301	301	1,806	279	283	283	282	288	284	1,779
Mean	13.30	8.50	9.27	9.99	12.43	13.59	17.28	0.86	0.97	0.93	0.87	0.65	0.59	0.78
Median	0.72	0.67	0.77	0.87	0.97	1.12	0.96	0.59	0.73	0.72	0.62	0.49	0.43	0.55
Std	73.89	38.97	42.31	45.99	61.76	65.57	98.71	1.24	1.39	0.97	1.06	0.73	0.57	1.03
Min	0.00	0.01	0.02	0.05	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	836.00	374.52	430.89	474.02	618.57	634.67	1,381.50	16.24	19.53	10.65	11.44	8.13	3.92	19.53
	Total deposits in US $ Bill							Capital adequacy ratio tier 1 (CAR %)						
N	295	300	299	301	301	301	1,804	206	215	215	280	299	298	1,500
Mean	7.72	8.50	9.27	9.99	12.43	13.59	10.23	12.07	12.03	12.16	12.52	12.19	12.20	12.20
Median	0.64	0.67	0.77	0.87	0.97	1.12	0.82	11.00	10.90	11.30	11.51	11.30	11.20	11.21
Std	35.08	38.97	42.31	45.99	61.76	65.57	49.59	4.84	4.15	4.02	4.28	4.26	4.34	4.32
Min	0.04	0.01	0.02	0.05	0.06	0.07	0.00	6.90	6.80	7.00	6.80	6.00	6.00	6.00
Max	364.24	374.52	430.89	474.02	618.57	634.67	634.67	53.10	41.99	42.41	43.98	41.11	40.72	53.10
	Total capital adequacy ratio tier 1 (CART %)							NonPerformLoanPctResLoanLoss (NPLRLS %)						
N	206	214	214	279	300	298	1,498	279	283	283	282	288	283	1,696
Mean	13.65	13.64	13.81	13.19	13.85	13.78	13.85	65.90	69.51	63.08	56.51	47.14	46.00	58.03
Median	12.45	12.50	12.90	13.20	12.85	12.66	12.80	44.29	49.43	49.33	45.49	37.68	34.42	43.25
Std	4.67	3.97	3.82	4.10	4.04	4.13	4.13	101.52	101.11	74.85	52.65	43.29	44.75	74.24
Min	8.40	8.30	8.60	7.20	10.00	8.30	7.20	0.00	0.02	0.10	0.02	0.01	0.01	0.00
Max	54.00	43.25	43.64	45.16	42.14	41.66	54.00	1,353.39	1,364.08	894.83	574.08	409.61	428.85	1,364.08

Table 3-5 Descriptive statistics for firm performance measures

This table reports a summary statistics for firm performance measures extracted from Worldscope database-Thomson One Banker. The data sample is 301 and data period analysed is from 2000-2005. It shows the observations, mean value, median value, standard deviation value, and minimum and maximum value (s) in column one. The data sample consists of return on equity variable defined as net profit after tax divided by equity. Return on assets variable is calculated as profit before interest and tax divided by book value of asset. Tobin's Q is denoted as Q and defined as market value of equity plus total liabilities divided total assets.

	Return on equity (ROE)							Return on assets (ROA)						
Year	2000	2001	2002	2003	2004	2005	Pooled	2000	2001	2002	2003	2004	2005	Pooled
N	298	300	300	301	301	299	1,799	287	288	293	289	287	285	1,727
Mean	10.17	11.16	10.86	11.65	11.9	11.82	11.25	1.4	1.34	1.41	1.4	1.37	1.4	1.38
Median	12.52	12.24	12.99	12.52	12.08	12.1	12.40	1.43	1.4	1.42	1.41	1.37	1.42	1.40
Std	17.72	8.02	20.75	13.86	5.48	7.1	13.41	1.03	0.73	0.78	0.58	0.51	0.56	0.72
Min	-171.22	-79.13	-291.65	-180.11	-11.75	-64.78	-291.65	-10.55	-5.78	-4.89	-1.24	-0.11	-2.38	-10.55
Max	25.9	37.85	55.37	38.55	34.9	26.55	55.37	5.93	4.19	6.48	3.95	4.1	3.55	6.48
	Market capitalisation (MKTCAP) in US $ Bill							Tobin's Q (Q)						
N	275	281	290	292	293	291	1,720	275	281	290	291	293	291	1,719
Mean	3.32	3.30	2.78	3.61	4.33	4.28	3.61	1.05	1.06	1.06	1.10	1.10	1.08	1.08
Median	0.10	0.11	0.14	0.21	0.25	0.25	0.17	1.03	1.05	1.05	1.08	1.10	1.08	1.07
Std	18.33	18.22	14.09	18.52	21.87	21.39	18.92	0.09	0.07	0.05	0.06	0.06	0.05	0.07
Min	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.90	0.91	0.95	0.97	0.96	0.96	0.90
Max	256.45	259.91	180.90	250.32	250.28	241.69	259.91	1.58	1.39	1.31	1.29	1.35	1.26	1.58

Table 3-6 Ownership and board structures descriptive statistics for sorts by Total Assets

This table reports some summary statistics for ownership and board structures extracted from the proxy statements; DEF-14A forms. The data sample is 301 and data period analysed is from 2000-2005. It shows the observations, mean value, standard deviation value, and minimum and maximum value (s) in column one. The variable Chief executive officer ownership is as the percentage of shareholdings by the CEO based on shares outstanding. Blockholders ownership is a percentage of shares held by institutions or individuals with greater than or equal to 5% ownership of the shares outstanding. CEO-Chair split is a dummy variable equals to 1 where chairman is also the CEO, or otherwise 0. CEO tenure is the number of years served by the CEO. Board size is total number of board of directors on board. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size. Firms are sorted on Total Assets basis where Q1is a quintile that represents firms with the lowest values of total assets, Q5 is quintile that represents firms with highest values of total assets, and Q3 is the cut-off point.

	Panel A: Ownership Structure															
	CEO ownership (CEOWN)				Managerial Ownership (INSOWN)				Institutional ownership (INSTOWN)				Blockholders ownership (BLOCK)			
Quintile boundary	Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max
1-Min	0.04	0.07	0.00	0.48	0.21	0.14	0.03	0.72	0.14	0.12	0.05	0.56	0.21	0.14	0.05	0.68
2-40%	0.04	0.06	0.00	0.42	0.18	0.13	0.02	0.61	0.16	0.15	0.05	0.93	0.25	0.20	0.05	0.95
3-60%	0.05	0.07	0.00	0.34	0.17	0.12	0.01	0.59	0.14	0.08	0.04	0.54	0.22	0.15	0.05	0.68
3-80%	0.05	0.09	0.00	0.51	0.15	0.14	0.01	0.59	0.14	0.10	0.05	0.96	0.23	0.19	0.05	0.96
5-Max	0.02	0.04	0.00	0.39	0.08	0.12	0.00	0.87	0.17	0.19	0.00	0.91	0.23	0.22	0.05	0.93
	Panel B: Board Structure															
	CEO-Chair (SPLIT)				Board size (BDSIZE)				CEO tenure (years)				Fraction of independent directors (FINBD)			
1-Min	0.28	0.45	0.00	1.00	10.39	400	4.00	33.00	9.07	7.32	1.00	33.00	0.78	0.12	0.33	0.95
2-40%	0.37	0.48	0.00	1.00	10.34	2.88	4.00	20.00	8.99	6.64	1.00	38.00	0.77	0.12	0.27	0.94
3-60%	0.45	0.50	0.00	1.00	11.79	3.41	5.00	24.00	10.42	9.45	1.00	46.00	0.75	0.14	0.25	0.94
4-80%	0.54	0.50	0.00	1.00	12.08	3.75	5.00	25.00	9.59	7.33	1.00	42.00	0.72	0.16	0.29	0.96
5-Max	0.71	0.45	0.00	1.00	15.39	4.54	6.00	31.00	9.64	8.57	1.00	49.00	0.77	0.13	0.2	0.96

Table 3-7 Descriptive statistics for compensation of CEO for sorts by Total Assets

This table reports a summary statistics of compensation for CEO and executive officers extracted from the proxy statements; DEF-14A forms. The data sample is 301 and data period analysed is from 2000-2005. It shows the observations, mean value, standard deviation value, and minimum and maximum value (s) in column one. Stock ownership compensation value to CEO, labelled as CEO-STOCK. Black-Scholes value of stock options compensation to CEO, labelled as CEO-OPT. Total equity-based compensation to CEO which includes common stock value and Black-Scholes value of stock options, labelled as CEOEB. Cash compensation is the summation of annual bonus and salary compensation to CEO, denoted as CEO-CB. Total compensation is the summation of cash-based, stock ownership and stock options values, denoted as TC. All figures are US$ in millions. Firms are sorted on Total Assets basis where Q1is a quintile that represents firms with the lowest values of total assets, Q5 is quintile that represents firms with highest values of total assets, and Q3 is the cut-off point.

	Stock ownership (CEO-STOCK)				Stock options (CEO-OPT)				Total equity compensation (CEOEB)			
Quintile boundary	Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max
1-Min	0.83	1.57	0.00	12.50	0.04	0.08	0.00	0.70	0.85	1.57	0.00	12.50
2-40%	2.10	4.67	0.00	25.90	0.08	0.13	0.00	0.97	2.14	4.66	0.00	25.90
3-60%	4.85	9.70	0.00	104.00	0.14	0.28	0.00	4.27	4.93	9.70	0.00	104.00
4-80%	16.20	38.70	0.00	328.00	0.49	0.72	0.00	5.75	16.50	38.80	0.00	329.00
5-Max	44.30	114.00	0.00	1,190.00	4.11	4.62	0.00	36.30	46.50	114.00	0.00	1,190.00
	Cash compensation (CEO-CB)				Total compensation (TC)							
1-Min	0.20	0.11	0.00	0.59	1.05	1.58	0.00	12.70				
2-40%	0.28	0.14	0.00	1.53	2.41	4.67	0.00	26.20				
3-60%	0.40	0.21	0.00	1.59	5.33	9.73	0.00	104.00				
4-80%	0.64	0.41	0.00	2.85	17.20	38.90	0.00	330.00				
5-Max	1.84	2.50	0.00	24.70	48.40	115.00	0.00	1,210.00				

Table 3-8 Descriptive statistics for assets, liabilities, assets quality, and capital quality for sorts by Total Assets

This table reports some summary statistics for assets, liabilities, assets quality, and capital quality extracted from Worldscope database-Thomson One Banker. The data sample is 301 and data period analysed is from 200-2005. It shows the observations, mean value, median value, standard deviation value, and minimum and maximum value (s) in column one. The data sample consists of book value of total asset comprising earning assets and non-earning assets. Total loans variable labelled include personal, commercial and mortgage loans. Total deposits variable is the summation of savings, time and demand deposits. Total liabilities variable include total deposits and other liabilities. Non-performing Loans reserves loans losses ratio is defined as Non-performing Loans divided by reserves loans losses. Non-performing loans to total loans ratio variable is defined non-performing loans divided by total loans. Capital adequacy ratio tier 1 is calculated as tier 1 capital divided by weighted risk assets and Capital adequacy ratio variable is defined as the sum of Tier 1 capital and Tier 2 capital divided by weighted risk assets. Firms are sorted on Total Assets basis where Q1is a quintile that represents firms with the lowest values of total assets, Q5 is quintile that represents firms with highest values of total assets Q, and Q3 is the cut-off point.

	Total loans in US $ Bill				Total deposits in US $ Bill				Total liabilities in US $ Bill			
Quintile boundary	Mean	Std	Min	Max	Mean	Std	Min	Max	Mean	Std	Min	Max
1-Min	0.19	0.08	0.00	0.40	0.23	0.09	0.01	0.47	0.26	0.10	0.00	0.51
2-40%	0.42	0.13	0.12	0.83	0.48	0.13	0.22	0.82	0.55	0.14	0.31	0.94
3-60%	0.74	0.26	0.19	1.71	0.86	0.26	0.40	1.72	1.02	0.31	0.53	1.92
4-80%	1.76	0.77	0.18	5.13	2.08	0.84	0.60	4.99	2.54	0.99	1.08	5.73
5-Max	43.51	93.82	1.72	583.50	47.90	103.16	2.69	634.67	82.53	209.27	3.48	1,381.50
	Capital adequacy ratio tier 1 (CAR)				Total Capital adequacy ratio (CART)				Non-performing loans to total loans (NPLTl)			
1-Min	14.35	6.64	7.20	53.10	15.67	6.58	7.20	54.00	0.85	1.08	0.00	11.44
2-40%	12.28	3.50	6.80	39.00	13.62	3.43	9.20	39.80	0.74	0.85	0.00	8.41
3-60%	12.67	4.42	7.00	39.20	14.01	4.34	8.30	40.00	0.81	0.80	0.00	8.13
4-80%	12.08	3.39	6.80	37.98	13.50	3.31	8.40	38.69	0.89	1.59	0.00	19.53
5-Max	10.35	2.36	6.00	19.80	12.91	1.93	10.00	23.30	0.78	0.54	0.05	3.38

	NonPerformLoanPctResLoanLoss (NPLRLS)			
1-Min	65.25	71.53	0.00	584.30
2-40%	52.84	52.95	0.01	503.14
3-60%	56.48	45.20	0.02	280.57
4-80%	65.61	127.01	0.01	1,364.09
5-Max	50.19	29.76	2.82	212.99

Table 3-9 Descriptive statistics for firm performance measures for sorts by Total Assets
This table reports a summary statistics for firm performance measures extracted from Worldscope database-Thomson One Banker. The data sample is 301 and data period analysed is from 2000-2005. It shows the observations, mean value, median value, standard deviation value, and minimum and maximum value (s) in column one. The data sample consists of return on equity variable defined as net profit after tax divided by equity. Return on assets variable is calculated as profit before interest and tax divided by book value of a asset. Market capitalisation is defined market share price multiplied by common shares outstanding. Tobin's Q is denoted as q and defined as market value of equity plus total liabilities divided total assets. Firms are sorted on Total Assets basis where Q1 is a quintile that represents firms with the lowest values of total assets, Q5 is quintile that represents firms with highest values of total assets, and Q3 is the cut-off point.

	Return on assets (ROA)				Return on equity (ROE)			
Quintile boundary	Mean	Std	Min	Max	Mean	Std	Min	Max
1-Min	1.02	1.05	-10.55	5.93	6.20	22.16	-291.65	33.50
2-40%	1.33	0.57	-3.80	2.77	10.73	12.97	-149.51	32.88
3-60%	1.35	0.49	-2.51	2.96	11.55	6.28	-64.78	25.02
4-80%	1.51	0.59	-1.52	6.48	13.16	6.71	-34.38	55.37
5-Max	1.70	0.60	0.29	4.84	14.62	10.96	-171.22	38.55
	Tobin's Q (q)				Market capitalisation (MKTCAP) in US $ Bill			
1-Min	1.04	0.04	0.91	1.20	0.04	0.02	0.00	0.15
2-40%	1.06	0.06	0.94	1.35	0.09	0.05	0.00	0.33
3-60%	1.06	0.06	0.90	1.26	0.18	0.10	0.01	0.56
4-80%	1.09	0.06	0.94	1.32	0.53	0.34	0.05	2.20
5-Max	1.12	0.08	0.97	1.58	16.47	38.84	0.20	259.91

Figure 3-1 The mean board size over the period 2000-2005

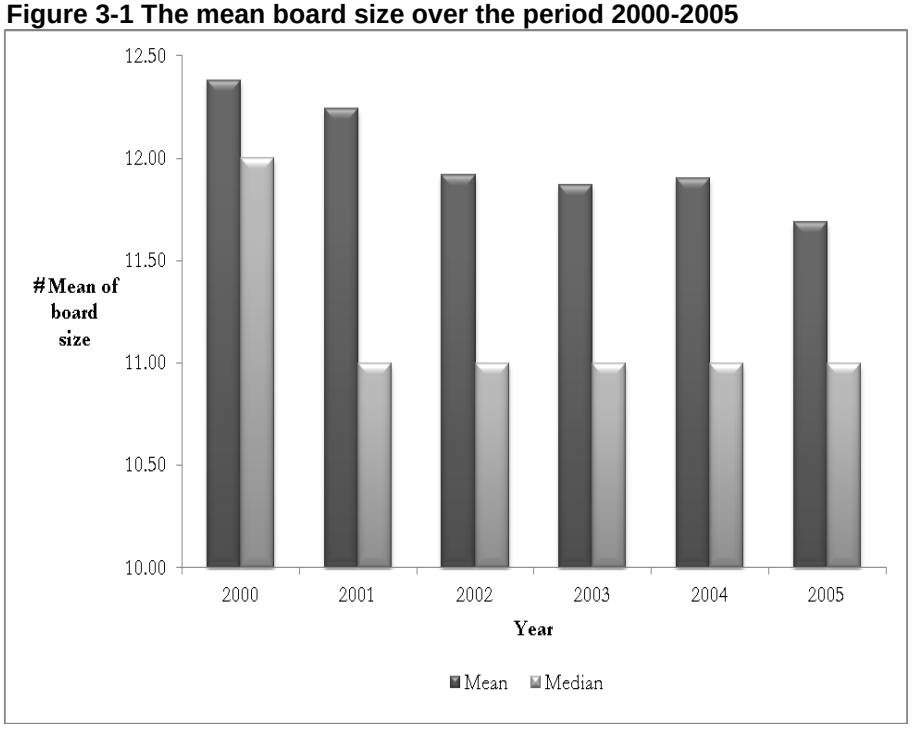
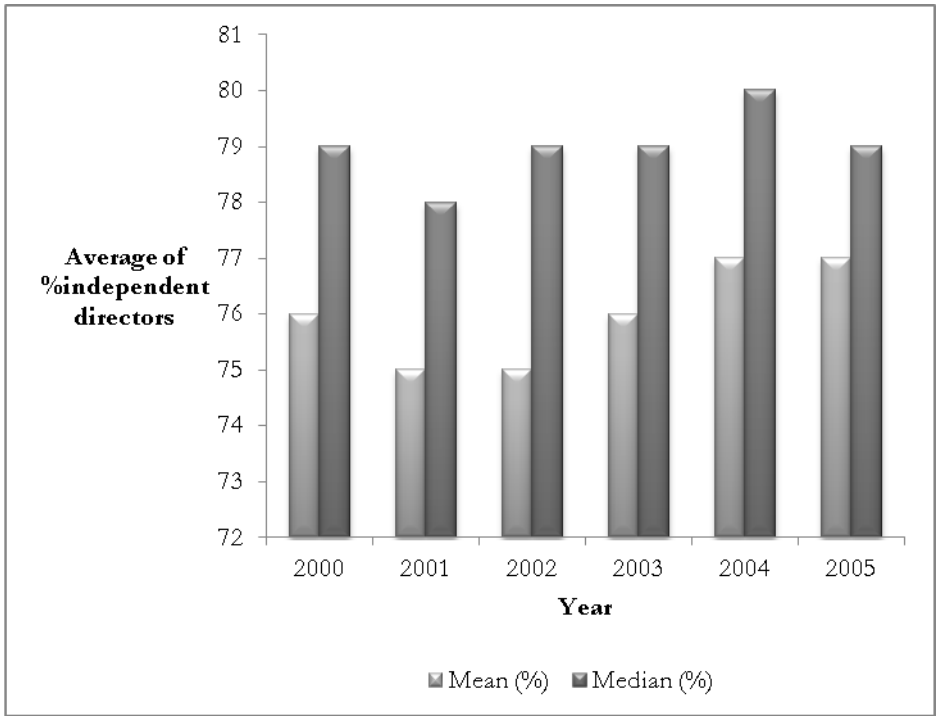


Figure 3-2 The mean percentage of board independence over the period 2000-2005



Chapter 4: Distance to Default, Subordinated Debt and Market Discipline

4.1 Introduction

This empirical chapter investigates whether bank holding companies that issue subordinated debt show an increase in the extent to which bank fundamentals predict the likelihood of their default (relative to their counterparts without subordinated debts). Besides, it examines whether the banks' charter values or capitalisation transmit further information to market participants which increase the reliability of bank fundamentals to predict default risk. Campbell et al. (2008) define distance to default as "the difference between the asset value of the firm and the face value of its debt, scaled by standard deviation of the firm's asset value".

Overall, at a minimum, the evidence presented in this empirical chapter provides support to the market discipline hypothesis. This hypothesis states that the movement in prices of bank sub-debt securities – i.e. distance to default-reflects timely and reliable information and consequently mirrors the changes in bank accounting information risk. Under this hypothesis, sub-debt bank investors face increased costs as bank select risky asset portfolios owing to conjectural protection schemes. Indeed, these uninsured counterparty investors tend to price bank sub-debt securities higher for additional perceived risk. Accordingly, if a bank fails to compensate them proportionally, they can discipline it through demanding higher rewards, withdrawing uninsured deposits, or shifting to credible and low risk-profile banks elsewhere (Martinez-Peria and Schmukler, 2001). Specifically and along with (H1), the investigation indicates some ability of distance to default to predict financial distress in sub-debt banks.

Hence, distance to default is associated with bank risk fundamentals. With this, there are three possible explanations to this relationship: First, sub-debt securities increase the amount of informational efficiency of distance to default leading to increased predictive power of the models for banks which issued these securities. Bank sub-debt private monitors – i.e. institutional investors - are not mainly covered by deposit insurance policy the same as the dispersed and unsophisticated depositors. Consequently, bank sub-debt investors have more monitoring incentives to protect their large invested capital. Second, the tension between distance to default and bank risk fundamentals confirms the existence and

importance of market discipline tool in monitoring excessive risk-taking incentives. Along this, it is proposed by Flannery (1998) that banking firms require an additional specific corporate governance system – i.e. a market discipline through private sub-debt investors - to discipline managers against excessive risk-taking behaviour. Finally, such findings can cast doubts on policy issues of the Gramm-Leach-Bliley's legislation pre-requisite which stipulates that large bank holding companies should maintain at least one issue of subordinated notes and debentures at all times (Krishnan et al., 2005; Goyal, 2005).

Furthermore, this study finds that in higher charter value banks and low-capitalised banks distance to default is significantly predicted by bank risk-fundamentals. For higher charter value banks, it can be explained that their asset values are informationally more efficient to reflect accounting risk-data. For low-capitalised banks, it can be argued that the informational efficiency of book-based risk measures will be higher as investors face an increased risk of default in these sub-debt banks. In fact, market-related indicators have turned to be important in complementing accounting risk data when regulatory bodies are assessing bank fragility (Flannery and Sorescu, 1996; Flannery, 1998; Evanoff and Wall, 2001; Hancock and Kwast, 2001; Sironi, 2003; Gropp et al., 2004, 2006). Additionally, bank regulators have long stressed the importance of these signals as a measure of banks' financial distress and a purveyor of market discipline. Amid pervasiveness of bank failures, the 2007-09 financial crisis and the inability of accounting-based information to reliably predict bank bankruptcy - have also highlighted the need of market indicators.

The operation of deposit insurance schemes and any explicit or implicit bail-out policy by the monetary authorities shield bank creditors from potential losses and give rise to moral hazard. Bank subordinated notes and debentures ("sub-debt") issuers are uninsured, in addition to being at a higher risk due to the inherent junior debt subordination feature in the creditors' hierarchy and the long holding maturity period (Gorton and Santomero; 1990). Based on this factual information, there is a high likelihood for sub-debt investors to lose their invested money in case a bank is liquidated. Otherwise they will be serviced after more senior debt claimants[42].

[42] Typical, loss rates in the event of default for senior secured, subordinated and zero coupon bonds are 49, 68 and 81 per cent, respectively (Crosbie and Bohn, 2003).

In an information efficient market, sub-debt spread (e.g. over Treasury Bills of similar maturity), form an accurate reflection of asset quality, managerial skills and ultimately, the likelihood of distress. To minimize losses on their investment, sub-debt holders have interests in the running and monitoring of the bank management. By the same token, the prospect of higher funding costs for banks that issue subordinated notes and debentures provides an ex-ante incentive to banking firms to refrain from undue risk-taking (see Nier and Baumann, 2006). As such, bank sub-debt holders are different from bank equity investors. The difference emerges from the conflicting risk-preferences perspective. In a moral hazard environment, bank equityholders have greater incentives to pursue excessive risk strategies that increase their equity call-put options (Jensen and Meckling, 1976; Merton, 1977). While bank sub-debt investors have more incentives to monitor managerial risk-shifting behaviour that assure them of the promised repayments on their investments (i.e., when firm's asset market value is greater than the present value of promised cash flows), bank equity holders are less risk-averse. In this perspective, bank sub-debt investors and regulators have universal interests as they share similar risk exposures (Flannery, 1998).

While previous work on the information in sub-debt spreads is massive and has produced mixed results, there has been little research on market discipline about information in the sub-debt distance to default. Three papers employ distance to default methodology to link bank risk fundamentals. Gropp et al. (2004, 2006) report that negative distance to default or spread on sub-debts decreases in the market value of the bank's assets and increases in leverage and asset volatility. Gropp et al. (2006) show a positive association between composite score and negative distance to default. Akhigbe et al. (2007) find a connection between default likelihood indicator and specific risk factors in commercial banks. This literature offers an insight that bank securities' prices incorporate all available information associated with the banks' financial condition.

This empirical chapter makes three major contributions to the existing literature. One, to the best of my knowledge, this is the first study to contrast the ability of distance to default to predict bank risk fundamentals of distress for banks that issue subordinated notes and debentures with banks that do not issue sub-debts. Previous work on subordinated notes and debentures and market discipline limited itself to examining subordinated debt yields (i.e., Avery et al., 1988; Gorton and Santomero, 1990; Flannery and Sorescu, 1996; and many successors). In effect,

this evaluation reinforces the extant research by indicating that sub-debt distance to default is relevant for market discipline in sub-debt banks. Two, it contributes to analysing distance to default on low- through high-chartered banks and low versus high-capitalised banks. For sub-debt banks, some quintiles of banks (i.e., sorted on charter value-basis) and low- against high-capitalised banks, the connection between distance to default and bank risk fundamentals is new.

Three, it adds to the literature on leading indicators of bank financial distress literature by analysing the connection between default likelihood and bank risk fundamentals. Currently, distance to default is considered as one of the important market-indicators in predicting bank financial problems (Gropp et al. 2004; 2006; Akhigbe et al. 2007). However, this literature is scarce. Bank supervisors and policymakers are interested in and have seen distance to default to have higher predicting ability than yield spreads. Thus, as argued by previous researchers, it may complement the accounting risk-based data to signal the possibility of bankruptcy. Such analysis allows for some inferences under which market indicators may substitute or complement regulatory intervention (see Adams and Mehran, 2003; Elyasiani and Jia, 2008). From this analysis, supervisory authorities may supplement their traditional monitoring mechanisms by market-based indicators – to reinforce oversight or early scrutiny in complex banks. Finally, the investigation is policy motivated due to the fact that its findings are consistent with the ongoing market discipline discussion around Basel II Framework and Gramm-Leach-Bliley requirements. These mandatory legislations favour larger bank holding companies to issue subordinated notes and debentures for bank capital to enhance market discipline – i.e. transparency and disclosure.

The chapter is organised as follows. Section 4.2 discusses the theoretical literature. Section 4.3 develops the hypotheses and discusses the empirical model. Section 4.4 introduces the sample. Section 4.5 presents empirical results, and Section 4.6 concludes.

4.2 Theoretical Motivation

Theoretically, in an efficient market, security prices should reflect all available information including investors' expectations about the firm's future prospects. In a banking context, whether the market prices of subordinated bank debt securities provide signals for the increased bank risk-taking behaviour is a debatable issue – i.e. that is, whether market discipline exists in bank holding companies. Fluctuation

in subordinated notes and debentures prices is useful information to assess how the bank balance sheet accounting risk data changed (Flannery and Sorescu, 1996; Sironi, 2003; Krishnan et al., 2005; Akhigbe et al. 2007). In fact, this volatility pattern indicates bank excessive risk-taking and motivates uninsured sub-debt investors to demand higher returns on their securities. In the Merton (1977) model, bank shareholders prefer more risks that maximise the value of their equity put options by increasing the asset portfolio risk.

Similarly, in this environment, if uninsured subordinated debt holders are not adequately compensated by banks, where additional risk taking is being perceived, they punish banks for their bad behaviour (Martinez-Peria and Schmukler, 2001). Here, one would expect that bank risk fundamentals would have a higher predictive ability in explaining distance to default for banks with subordinated debt – suggesting the existence of market discipline. In contrast, if contemporaneous price signals of subordinated debt instruments are not properly processed, then such market discipline may not occur - i.e. no detectable link between distance to default/yield spreads and bank accounting risk measures. The role of the bank's charter value is also important in this setting. Keeley's (1990) model indicates that the bank's charter value is vital with regards to risk-taking. A high charter value is a monitoring device that mitigates managerial risk-taking in banks. From this theory, the relationship between distance to default and bank risk fundamentals, is expected.

4.3 Hypotheses development and empirical model

4.3.1 Hypotheses

It is hypothesised that if market discipline exists, one would predict accounting risk information to be associated with distance to default in subordinated debt banks. The argument is that the contemporaneous information content in banks that issue sub-debts is greater and readily available to the respective investors to identify banks' risk exposures (Flannery and Sorescu, 1996; Flannery 1998; Sironi, 2003; among others). The information summarised in the prices of these debt securities is likely to result in bank risk-fundamentals, explaining a larger fraction of the cross-sectional variation in distance to default for sub-debt banks. Alternatively, if the

information content in sub-debt securities is of low frequency, no relationship is expected between distance to default and bank risk-fundamentals.

Comparing the performance of predicting power between distance to default and yield spread indicators in sub-debt banks, Gropp et al. (2004) documented higher predictive ability in the former over the latter market indicators. For example, they report that, while “distance to default prediction worsens between 6 and 18 months in advance, yield spread predictive power diminishes beyond 12 month prior to downgrade”. In this context the study tests whether banks that issue sub-debts increase the information content available to bank sub-debt investors so that distance to default measures can be predicted by a larger variation of accounting risk measures. The central testable hypothesis is:

H1: The predicting power of distance to default is larger for banks which issue subordinated notes and debentures than for banks without outstanding subordinated notes and debentures.

Generally, a bank’s charter value refers to the present value of its future expected earnings in a regulated environment. It is hypothesised that the bank’s charter value may act as a self-imposed disciplinary factor to mitigate moral hazard problems (Keeley, 1990). Higher charter values increase the cost of bank distress, because managers cannot sell valuable charters in the event of insolvency. Similarly, one would expect that debt contracts issued by banks with low charter value would offer higher yield spreads and/or more restrictive covenants (Goyal, 2005). It further lowers the managers’ ex-ante incentives for risk-taking (Demsetz et al., 1996; Galloway et al., 1997; Saunders and Wilson, 2001; Goyal, 2005). Accordingly, for banks that issue subordinated notes and debentures, higher charter values diminish incentives in these banks to take greater risks. This is due to the fact that sub-debt investors are motivated to monitor the banking institutions. Thus, the degree to which the book-based accounting measures explain distance to default should be larger for banks with high charter value, where private monitoring by sub-debt investors is relatively more important and interesting. However, higher distance to default in this group of banks reflects lower default risk likelihood and less regulatory interferences.

From the above assertion, low chartered value banks have incentives to engage in greater risk-taking strategies that could be constrained by regulatory discipline

tools. During the period of policies related to deregulation and reform (i.e., Gramm-Leach-Bliley Act of 1999), managers of high charter value banks are likely to pursue risky activities as managers of low charter value banks that maximise the equity call-option of their shareholders. Based on these arguments, this investigation complements previous studies by exploring whether sub-debt banks with high charter value would enhance the level of risk-taking that increases distance to default sensitivity to accounting information. This leads to the second hypothesis associated with distance to default and bank risk fundamentals for banks with high charter value:

H2: The degree to which distance to default is explained by bank risk fundamentals is higher in banks with high charter value.

Capital reserves are perhaps the most important indicator of the overall stability of a banking firm. Banks with higher capital should display lower default risk than banks with thinner capital cushions. Given the lower risk of default for highly-capitalised banks (with larger distance to default), Elyasiani and Jia (2008) and Flannery and Rangan (2008) argued that well-capitalised banks are less likely to face intervention from either market investors in subordinated bank debts or regulators. This is because sound capital adequacy regulations are intended to limit excessive risk-taking and default risk on uninsured deposits. In this sense, it is may be logical that a sufficient capital policy requirement represents formal bank governance in well-capitalised banks.

For undercapitalised banks in which their capital adequacy regime may be ineffective, private monitoring could be more important to reduce the extent of financial distress and default risk on deposits. Consistent with the market discipline hypothesis, therefore, institutional investors holding huge amounts of uninsured deposits have higher incentives to monitor and discipline undercapitalised banks once there are financial distress signals. With these arguments market discipline can provide additional corporate governance in bank holding companies (Flannerly, 1998) and complement weak capital adequacy regimes.

Therefore, in line with the views above, it is argued that the information efficiency of book-based risk measures will be higher if investors face an increased risk of default in the low-capitalised sub-debt banks. This leads to the third hypothesis

associated with distance to default and bank risk fundamentals in undercapitalised banks:

H3: The degree to which distance to default is explained by bank fundamentals is higher in banks with low capitalisation.

4.3.2 Methodology

This section describes and justifies the dependent, independent, and control variables from the perspective of previous empirical and theoretical studies. It begins by explaining the dependent variable. Next, the section discusses the explanatory variables in sequence and finishes with control variables.

A. Distance to Default

Distance to default is used as the dependent variable. Black and Scholes (1973) and Merton's (1974) employ the distance to default model as a market-based measure of banking distress. As distance to default estimate is based on the theoretical foundation of contingent claims valuation model (Black and Scholes, 1973; Merton, 1974) it contains more information on volatility of the firm and market value of debt (Vassalou and Xing, 2004; Gropp et al., 2004). The model has been widely-used in industrial empirical research (Hillegeist et al., 2004; Vassalou and Xing, 2004; Gropp et al., 2004; Gropp et al., 2006; Akhigbe et al., 2007; Chan-Lau and Sy, 2007; Duffie et al., 2007; Bharath and Shumway, 2008; Campbell, et al., 2008).

Distance to default measures default risk as the number of standard deviations by which the market value of a bank's assets is above the default point – i.e. the default point is the point when the bank market value of assets is just equal to its book value of total liabilities (Gropp et al., 2006). The value and volatility of assets (V_A and σ_A, respectively) which are both unobservable using a system of simultaneous equations is inferred. The first step is the estimation of V_A, and σ_A, based on an iterative method as in Hillegeist et al. (2004), Vassalou and Xing, (2004) and Akhigbe et al. (2007). The market value of equity is expressed by the call option equation (4.1) on the value of the firm's assets.

$$V_E = V_A N(d1) - De^{-rT} N(d2) \tag{4.1}$$

where V_E represents the total market value of equity at year end, and *N (d1)* and *N (d2)* are the cumulative standard normal probability distributions of *d1* and *d2*, respectively. D is the face value of debt liabilities, and r represents expected asset growth rate.

$$d1 = \frac{\ln\left(\frac{V_A}{D}\right) + \left(r + \frac{\sigma_A^2}{2}\right)T}{\sigma_A \sqrt{T}} \tag{4.2}$$

$$d2 = d1 - \sigma_A \sqrt{T} \tag{4.3}$$

Asset and equity volatilities are linked in the following optimal hedge equation as:

$$\sigma_E = \left(\frac{V_A}{V_E}\right) N(d1)\, \sigma_A \tag{4.4}$$

V_A and σ_A in equation (4.1) and the hedge equation (4.4) are estimated by employing Newton search algorithm.

Equity volatility, σ_E, is estimated using daily stock returns collected from Datastream. Following Bharath and Shumway (2008), the standard deviation of daily stock returns multiplied by the square root of the average number of trading days in the year is set at 252 trading days. To solve the simultaneous system of equations (4.1) and (4.4), therefore, estimates of the starting values for σ_A and V_A are as follows; $\sigma_A = \sigma_E V_E/(V_E+D)$, and $V_A = D+V_E$. Employing Newton's search algorithm in the iteration procedure, the whole simultaneous system converged in the fifth-iteration at tolerance level of 0.01. At this stage, the two unknown variables (V_A and σ_A) are estimated and substituted for in equation (4.5). Following that, the instantaneous risk free rate (one-year US Treasury Bill rate) is used to represent

the expected returns. Finally, distance to default (-DD) is calculated following Vassalou and Xing (2004) and Gropp et al., (2006)[43]:

$$-DD = -\left[\frac{In\left(\frac{V_{A,t}}{D}\right) + \left(r - \frac{\sigma_A{}^2}{2}\right)T}{\sigma_A\sqrt{T}} \right] \tag{4.5}$$

B. Explanatory Variables

This section discusses the ex-ante signs of every regressor and their importance in the model specifications. Book-accounting information employed in this investigation has been used in previous empirical studies to measure bank risk (see Demsetz and Strahan, 1997; Evanoff and Wall, 2002; Sironi, 2003; Demirgüc Kunt and Huzinga, 2004; Elyasiani and Jia, 2008). Non-performing loans ratio is defined as non-performing loans divided by total loans denoted as NPLTL. This variable should positively affect distance to default as it indicates the quality of the bank loan portfolio, with higher values suggesting lower asset quality (Flannery and Sorescu, 1996; Akhigbe et al., 2007).

Reserve loan losses to total assets ratio, RLLA, should have a similar impact as the non-performing loans ratio on default likelihood (Sironi, 2003). Non-interest income divided by revenues is labelled as NIIR. This variable captures earnings diversification. Diversification reduces the return variance of a financial assets portfolio and should, hence, be negatively associated with default likelihood (Demsetz and Strahan, 1997). Cash and marketable securities over total assets ratio is denoted as CSD and it captures a banks' liquidity position (Martinez-Peria and Schmukler, 2001). This ratio should be negatively related to distance to default as higher liquidity levels signal a lower likelihood of financial distress (Sironi, 2003). Essentially, it reflects soundness and health of a bank.

Capital is defined as the ratio of the book value of equity to total assets, denoted by CAP. Well-capitalised banks are less vulnerable to economic shocks – and thus,

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[43] Increasing –DD (i.e. moving to the right on the -DD line) narrows the distance to default and, thus, makes default risk more likely. For banks A and B, if $-DD_A > -DD_B$, Bank B has a higher distance to default relative to Bank A.

CAP should be negatively associated with distance to default. The negative sign on book value equity to total asset ratio captures both low leverage banks (i.e., very strong banks - with high capital ratios) and small banks. Moreover, one would expect this direction to suggest a lower investment opportunity set in banks that are not well capitalised. In contrast, a positive association between bank capital and risk proxies suggests that equity investments are more risky (very weak banks – i.e., with low capital ratios) than assets (Sironi, 2003). These banks could be forced to enhance their capital positions as they might be unable to sustain huge losses in economic downturn periods.

To proxy leverage, the market value of common equity and the book value of preferred stock (MKTLEV) are used. Leverage should be positively related to distance to default as increasing costs to service liabilities will make default more likely. That is, a higher financial leverage suggests greater likelihood to default risk. Return on assets, ROA) is defined as income before tax divided by total assets. A positive relationship between profitability and default likelihood is expected as higher profitability may be achieved on the basis of higher risk-taking (Flannery and Sorescu, 1996). On the other hand, the negative linkage between risk and profitability measures could suggest greater efficiency by the management in downsizing incentives to risk-taking behaviour.

C. Control Variables

This study also controls for the effects of bank size and year dummies on distance to default. Natural log of a bank's total assets controls for the size of the firm is denoted as LNSIZE. The negative sign on bank size refers to more diversification of risk asset portfolios, greater disclosure, lower information asymmetry and bailouts benefits or too-big-to-fail in larger banks (Saunders et al., 1990; Flannery and Sorescu, 1996). In addition, firm size, past stock returns, and idiosyncratic returns variability have previously been identified as a relevant bankruptcy predictor (Shumway, 2001). Time effects which control intertemporal variations in market (macroeconomic) conditions, tax effects and bank sector differences are captured by the year dummy variable, d_t.

Following Flannery and Sorescu's (1996) and Martinez-Peria and Schmukler's (2001) approach of fixed effects panel regressions (unbalanced panel), bank risk fundamental coefficients are estimated. The fixed-effects estimator captures an

unobservable heterogeneity. It is preferred over other estimators. This is because it yields unbiased coefficients in contrast to random-effects modelling. In this specification, the estimator indicates the variation of distance to default over time – i.e., deviation from the mean of each bank. Each bank has also its own intercept. Hence, the dependent variable - negative distance to default is estimated in the following equation, 4.6. Bank risk fundamentals are lagged by one year to mitigate endogeneity issues.

$$-DD_{it} = u_i + d_t + \beta' Bank\ Risk\ Fundamentals_{i,t-1} + C_{i,t} + \varepsilon_{i,t} \quad (4.6)$$

where -DD is the distance to default representing the dependent variable. The primary interest focuses in the coefficient estimates of bank risk fundamental (β') variables (lagged) and defined in Appendix I. $C_{it,}$ d_t and μ represent control variables, year dummies and bank–specific fixed effects affecting distance to default, respectively. Finally, *i* indexes number of banks and *t* indexes number of years per bank. $\varepsilon_{i,t}$ is the error term with assumed Gaussian properties.

It is argued that equation 4.6 is theoretically sub-optimal since it ignores nonlinear, interactive effects between asset risk and leverage on distance to default (Gorton and Santomero, 1990; Flannery and Sorescu, 1996). Accordingly, as in Sironi (2003), two interactive variables are included to represent this nonlinear risk relationship. These interactive variables are ROAMKLEV (the product of ROA and MKTLEV), and RLLAMKLEV (the product of RLLA and MKTLEV).

4.4 Sample Selection

To construct the sample of banks, I identify US bank holding companies and any outstanding subordinated notes and debentures from FR Y-9C filings with the Federal Reserve Bank of Chicago at the end of the fourth quarter. I then match sample banks with financial information available on the Datastream database over the period 1998-2007.

The number of bank holding companies in the sample that have issued subordinated notes and debentures and bank holding companies without subordinated notes and debentures is 98 and 128, respectively. The sample size is

closely comparable to that of other studies (e.g., Flannery and Sorescu, 1996; Evanoff and Wall, 2001; Bliss and Flannery, 2002; Goyal, 2005; Flannery and Rangan, 2008; Elyasiani and Jia, 2008). In Table 4-1, Panel A presents the key descriptive statistics for the pooled sample of bank holding companies which have issued subordinated notes and debentures. The sample mean (median) -DD value is 3.913 (3.618). Elyasiani and Jia (2008), using a sample of 110 bank holding companies report a mean (median) -DD of 3.376 (1.245) over the period 1992-2004. The explanation for these values being on the low side could be due to methodological differences. Elyasiani and Jia (ibid) defined DD as equity capitalisation to asset volatility ratio.

As expected, equity volatility is higher than asset volatility. This indicates decreases in the idiosyncratic volatility relative to the market volatility of individual banks over the period under investigation. Campbell et al. (2001) show that during the period 1962-1997, there was a remarkable increase in firm level volatility relative to market volatility. The authors argue that idiosyncratic volatility is influenced by institutional ownership or the opacity of firm fundamentals. The mean (median) values of equity volatility (σ_E) are 0.385 (0.298). These figures are on the high side compared to Elyasiani and Jia (2008) and Akhigbe et al. (2007) for the reason given above. Mean (median) values of annualized bank level volatility (σ_A) are 0.095 (0.045).

Regarding the accounting measures of risk, the mean (median) value of NPLTL is 0.671% (0.559%) and the mean (median) value of RLLA is 0.946% (0.899%). These proxies capture asset quality. Mean (median) values of CSD are 40.442% (35.156%). CSD measures bank liquidity. Mean (median) CAP and CART are 8.956% (8.494%) and 12.26% (11.96%), respectively. LEV and MKTLEV have mean (median) values of 11.310 (10.753) and 6.684 (5.466) which are on the high side, implying higher leverage and higher likelihood of default risk. In the sample, the mean (median) values for ROA are 1.460 (1.464) respectively. These measures show overall firm performance (Flannery and Sorescu, 1996).

To offer an initial empirical examination of the hypotheses, the study uses the univariate analysis-Welch test to compare bank risk fundamentals of SND banks and non-SND bank sub-samples. A SND bank is a firm that issued mandatory sub-debt security in any single year over the sample period 1998-2007 and a non-SND bank never issued this security over this period. The results are summarised in Table 4-1. Panel B reports this comparison results. Contrary to expectation, the

findings indicate no quantitative significant difference in non-performing loans ratio of the two groups. A possible explanation for this is that both sets of banks attempt to keep credit risk assets portfolio on the low side through complying with the prudential requirements. That means managers are enthusiastic about the migration risk of deteriorating credit portfolios to minimise loan losses and ensure good banks' credit/asset quality. However, reserve loan losses ratio indicates that SND banks set aside significant amount of cash (i.e., 0.946%) to conserve problem loans and unprecedented losses, as compared to 0.893% of non-SND banks.

In addition, non-interest income is larger in SND banks relative to non-SND banks. Their average values are 21.32% and 15.14%, respectively (with estimated difference significant at 1% level). Such pattern is consistent with the hypothesis that larger BHCs tend to better diversify their portfolio risk in the capital market (Saunders et al., 1990). Therefore, BHCs can generate more income from securities and insurance underwritings, merchant banking, and other expanding product lines. In support of this, Stiroh (2006) has shown that the US banking firms are moving from conventional sources of interest income lending activities towards lucrative business that brings in more non-interest income. Capital-to-asset ratio (CAP) and total risk asset ratio (CART) are lower for SND banks compared to non-SND banks. In both cases, the decrease in difference is statistically significant at 1% level.

On the other hand, leverage ratio is higher in SND banks than in non-sub debt banks. The increase in difference is statistically significant at 1%. This pattern of findings is consistent with the view that more highly-leveraged firms and low capital ratio are associated with higher default risk (Lev, 1976). As such, distance to default exhibits higher predicting power in SND banks as compared to non-SND banks, consistent with H1. Higher liquidity assets ratio in non-SND banks may reflect their inability to access capital markets. Contrary to expectation, non-sub debt banks hold larger assets (significant at 1% level) than SND banks, suggesting that many large banks are yet to comply with the mandatory SND issuance clause.

4.5 Empirical Results

Panel A of Table 4-2 presents a correlation matrix of the variables employed to estimate -DD. The correlation between -DD and equity volatility (σ_E) and asset volatility (σ_A) are 0.342 and 0.613, respectively. Equity volatility and asset volatility

are almost perfectly correlated (0.902) (significant at 5%-level). This is because both variables capture the same firm risk characteristics.

Panel B of Table 4-2 reports pair-wise correlations between the independent variables, and shows that correlations among the variables are generally low. Large correlation above 0.3 is between LNSIZE and NIIR - of 0.560 and significant at 5% level. It is argued that the strong correlated variables suggest the presence of multicollinearity in the regression analysis. This investigation addresses this problem by orthogonalising these parameters. CART (total capital adequacy ratios) is negatively correlated with leverage, LEV at -0.111. This correlation could confirm that highly-leveraged banks exhibit lower capital buffers to absorb loan losses and other unforeseeable events.

4.5.1 Comparison of distance to default on bank holding companies with and without SND

This section contrasts the importance of book-based measures of risk in explaining distance to default for banks that issue subordinated notes and debentures compared with banks that do not issue sub-debt. In fact, the study measures whether the information content in bank fundamentals is contingent on banks issuing sub-debt. H1 predicts that book-based risk measures are comparatively more important in predicting default risk for banks that issue sub-debt. This is because investors in bank sub-debt are exposed to greater levels of market discipline than other bank creditors. Thus, they have higher incentives to monitor bank risk-taking. This is likely to result in higher bank risk-fundamentals explaining a larger fraction of the cross-sectional variation in distance to default in predicting default risk. To explore this, the sample is divided into two parts: (i) bank holding companies with outstanding subordinated notes and debentures (98), and (ii) bank holding companies without subordinated notes and debentures (128). Next, the regressions of bank risk fundamentals and control variables are run on distance to default for each subgroup.

The results in Table 4-3 for subordinated notes and debenture banks reveal that non-performing loans ratio, NPLTL enters models (1) and (3) with positive signs and is significant at 5% and 10% levels, respectively, as expected. The possible interpretation for this is that banks with poor loan portfolios (poor assets quality) are more vulnerable to financial distress. The positive sign on coefficient estimate of

leverage LEV implies increasing funding costs on deposit interest-bearing accounts that may lead to higher credit default likelihood. Return on asset ratio, ROA in all specifications is never significant. However, this finding does not imply that more profitable banks are not associated with higher risk-taking. Other accounting risk measures show no association with distance to default in this sample.

To overcome multicollinearity between regressors, highly correlated variables are orthogonalised. For example, in model (2), non-interest income divided by revenues, NIIR and natural log of total assets, LNSIZE (i.e., 0.560) are orthogonalised. Subsequently, these orthogonalised parameters (NIIR_res and LNSIZE) are used in regression analysis instead of unorthogonalised ones. Consistently, their coefficient estimates are robust with the earlier predictions as reported in model (1), suggesting that multicollinearity is not a concern.

In Models (4) through (6) of Table 4-3, the same regressions for banks that have not issued subordinated notes and debentures are run. With the exception of orthogonalised liquidity risk – CSD_re, profitability – ROA, and leverage - LEV_res coefficient estimates, other risk fundamentals do not show any impact on -DD[44]. This differs from banks with sub-debt where only NPLTL and LEV enter the regression with a statistically significant coefficient. However, the leverage risk proxy appears to be the dominant determinant of financial distress for both types of banks. But, it is statistically significant (at 1% level in models (1) and (2)) in banks that issued sub-debts.

In addition, across all specifications (models 4 to 6), the estimated coefficient on CSD is positive and statistically significant at 1% levels in models (4) and (5), and at 5% level in model (6). The positive coefficient implies liquidity problems in non-subordinated notes and debentures banks which may increase the likelihood of default. That means that non-sub-debt banks are more vulnerable to liquidity risk. Turning to the profitability indicator, ROA is negatively associated with -DD (significant at 1% level) in models (4) and (5). This result contradicts the theory which states that higher return is linked with greater risk-taking and is inconsistent with those in by Akhigbe et al. (2007). The finding further explains that non sub-debt banks are more profitable, and are unlikely to be susceptible to default risk.

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[44] For non-sub debt banks in model (5), the pair correlation between CART and CSD is 0.379. As such, these parameters are also orthogonalised to account for the multicollinearity problem.

However, the banks' assets size (LNSIZE) variable is insignificant in all regression models. By contrast, Akhigbe et al. (2007) indicate strong connection between bank size (i.e., measured by the natural log of the market value of equity) and default likelihood.

Generally, banks that issue sub-debt revealed slightly lower predictive power of -DD versus banks that do not issue sub-debt instruments. This explanatory power gets better after controlling for more risk fundamentals (provisions for loan losses to net loan losses, LLCR, the ratio of reserve loan losses to total assets, RLLA, the interaction of RLLALEV) – i.e. from adjusted R^2 equals 49% to 50% in models (1) and (3), respectively. The adjusted pseudo-R^2, shows that the model specification explains a larger proportion of the cross-section variation in distance to default. More important and consistent with the theoretical predictions (Gujarati, 2003), for banks that issued sub-debts, coefficient estimates are statistical significant. While, the reported higher adjusted R^2 in models (4) and (6) are 62% and 63%, respectively, for banks without outstanding sub-debts - this does not indicate bad model specifications in sub-debt banks. Arguably, larger asset size in non-SND banks as compared with SND banks may have resulted in higher R^2 in the former banks.

To further analyse the differences in the predictive power of bank fundamentals for subordinated notes and debentures banks and non-subordinated notes and debentures banks, a Chow test (partial F-test) is used to determine whether there are differences in the parameter estimates for the different sub-samples are conducted. The calculated F with d.f. =17, 1921 of 509.55 (p<0.000) is greater than the critical value of 1.63 at 5 % level of significance. Therefore, the null hypothesis that the parameter estimates are identical can be rejected. This intuition suggests that hypothesis (H1) is somehow supported - more analysis on this and robustness tests follow in the next section.

4.5.2 Further robustness checks

To further analyse the likelihood that the findings are not partly driven by model specification, a differences-in-differences methodology (see Bertrand and Mullainathan, 2003) is employed. Using a combined sample of 226 banks, this approach compares the change in the DD sensitivity for banks with subordinated debts and banks without these securities. The basic regression is OLS in equation 4.7. The results are presented in Table 4-4. dSND2 is the main coefficient of

interest, representing banks with sub-debts. dSND indicates 1 if the bank issued sub-debt, otherwise 0 – i.e. predicted to be positive[45]. Banks deemed less risky have their customers' deposits covered by the deposit insurance schemes. On the other hand, to reduce risk-shifting incentives to bondholders from shareholders, uninsured banks are mandated to issue subordinated debt that would boost private market discipline and mitigate risk-taking. Z represents similar risk bank fundamentals, already defined above. Therefore the estimated coefficient reflects the differences in distance to default sensitivity to banks with and without sub-debts. The finding indicates a significant positive coefficient on dSND, explaining that banks with sub-debt have a narrow distance to default. Across all regressions (models 2-6), after controlling for bank risk fundamentals, dSND also remains statistically significant at all conventional levels of significance.

$$-DD = \mu_i + \delta_i + \beta dSND_i + Z_i + \varepsilon_i \quad \text{.....(4.7)}$$

Based on these analyses, the results reported in Table 4-3 do not suggest that banks without sub-debts have higher explanatory power over those that do not have. In summarising, these findings lend some support to hypothesis (H1). Accordingly, H1 is justified. Moreover, across all regression models, distance to default varies inversely with residual of LNSIZERE at the 1% level. This finding may be interpreted as less likelihood of default risk in larger bank holding companies.

Finally, to mitigate the multicollinearity problem reported in Table 4-2, the highly correlated variables are orthogonalised – that means, each of these regressors is set to be uncorrelated to each other. The highest reported correlation of 0.560 is between LNSIZE and NIIR. Each of these correlated variables is represented by the residual from a regression of one factor on its respective correlated variable. Then, these residuals are used as regressors. To further multicollinearity checks, variance inflation factor (VIF) test - column 10 is carried out. In the OLS regression, the reported VIF tests for the dependent variable distance to default is significantly less than 10 for each used regressor. Therefore, VIF test suggests the absence of

[45] In this combined sample, it is relatively noted highly pairwise correlations between dSND2 and CSD (0.835), dSND2and LNSIZE (0.406), NIIR and LNSIZE (0.512), CSD and LNSIZE (0.329), and ROALEV and ROA (0.782). To account for multicollinearity, these pair variables,

both multicollinearity among independent variables and noise on the dependent variable. Over model specifications associated with multicollinearity – see table 4-3, model (2) and (5) and the discussion above.

4.5.3 Distance to default and charter value

This section considers whether the charter value of banks affects the degree to which fundamentals help predict bank distress. Valuable bank charters act as an incentive for bank managers to constrain their risk-taking behaviour. Hence, H2 proposes that higher charter values, due to an increased need for investors to monitor management, should increase the informational efficiency of bank fundamentals.

To test predictions, regressions of bank risk fundamentals on -DD for groups of banks located in different charter value quintiles are run. Charter value is proxied by Tobin's Q and assigns banks to quintile portfolios based on Q. Tobin's Q is employed instead of demand deposits to total deposits ratio, as it captures market power in terms of bank growth opportunities, relative to market power from deposit markets in the latter (Keeley, 1990). Tobin's Q has also been employed as a proxy for charter value by Hutchison and Pennacchi (1996) and Goyal (2005). Table 4-5 presents results of regression models for the lowest value quintile (Q1), middle (Q2-Q4), and the highest quintile (Q5) in the pooled sample of bank holding companies. dSND is a multiplicative dummy defined as 1 if the bank issued sub-debt, otherwise 0, and interacted with each of hypothesised bank risk fundamentals.

Across all regressions, the results show that the interaction variables NPLTL*dSND, CART*dSND, ROA*dSND and LNSIZE*dSND are not statistically significant. However this does not change the theoretical fact that -DD is sensitive to bank risk fundamentals in sub-debt banks. Models (1) and (4) of Table 4-5 report regressions on -DD for the lowest charter value quintile. This group is deemed to have higher incentives to engage particularly in risky investment activity. In these regressions, none of the bank risk fundamentals enter the specification with a statistically significant coefficient, except the interaction of MKTLEV*dSND and RLLAMKLEV*dSND. Surprisingly, MKTLEV*dSND carries a negative sign

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thus, are orthogonalised. Next, as a further confirmation for multicollinearity, in each regression model, VIF is estimated. It is found that the estimated VIF values are less than 4.

(significant at 10% level) in model (4), exhibiting lower leverage in medium banks with distance to default. Controlling for non-linearity, RLLAMKLEV*dSND enters model (4) positively (significant at 5% level) as predicted. In general, the hypothesis that bank risk fundamentals are equal to zero can be accepted, suggesting that they cannot explain the variation in -DD for sub-debt banks with low charter value.

In model (6), the interaction effect between asset risk and leverage on distance to default (RLLAMKLEV*dSND), which captures non-linear relationships, has a positive sign (significant at 1% level). This result is consistent with other empirical research. Sironi (2003) indicated that this interaction term positively impacts credit default spreads since credit risk becomes more relevant for higher-leveraged banks.

The results in Model (3) and (6), which relate to bank holding companies located in the highest charter value quintile, ROAMKLEV*dSND and MKTLEV*dSND, are negative and significant at 10% and 5% levels, respectively. The negative coefficient estimate on ROAMKLEV*dSND is consistent with the hypothesis on the management's efficiency in reducing the extent of credit defaults (Flannery and Sorescu, 1996). Consistent with the theory, in model (6), liquidity assets ratio, CSD*dSND, is positive explaining that liquidity risk is not a concern in large banks. In other words, large holding banks have in place sufficient liquidity levels and funding contingency mechanisms that mitigate bank liquidity risks. Hence, for banks with higher charter value - i.e. located in Q5, the bank risk accounting-based measures explain a higher share of the variation in distance to default. For instance, banks located in Q5 have higher adjusted R^2 in both regression models (i.e. 65.4% and 67.2 %). Collectively these findings are consistent with H2. Subsequently, the results could be explained by the theoretical support that banks with higher charter values - more valuable banks - are more frequently traded and their asset values are thus, informationally efficient and are more likely to reflect fundamentals. In this context, the reported adjusted R^2 =65.4% or 67.2 % might make the argument that it strengthens H1.

4.5.4 Distance to default and capital adequacy

This section analyses the extent to which accounting measures predict the distance to default of banks that are well-capitalised in relation with undercapitalised ones. This analysis disentangles banks that exhibit capitalisation levels above and below the sample median. It is hypothesised that investors and regulators will give

increased attention to banking firms with low capital reserves. Banks with low capital reserves will make private monitoring governance for market in subordinated debt banks relatively more important. Therefore, banks with low capital reserves display a higher degree of informational efficiency with regard to the extent to which the accounting data reflects default risk.

Table 4-6 runs regressions on -DD for banks that are capitalised below and above the sample median (i.e., 12.260% of total risk-based capital). For banks with low capital ratios in models (1-2) the coefficient on NIIR_res – i.e. capturing diversified fee-based activities, has the expected negative sign and is significant (at least at the 1%-level). Similarly, LNSIZE is negative and significant (at < 5% level). This suggests that the management efficiency through portfolio diversification decreases -DD as portrayed by NIIR_res and LNSIZE. As expected, -DD increases with leverage, LEV at 5% level of significance. This is consistent with the view that low-capitalised banks have incentives to achieve a higher risk-return profile through risk-shifting incentives (John, 1987).

The coefficient estimates for well-capitalised banks are reported in models (3) and (4). As in low-capitalised, NIIR_res carries the negative sign. The two regression models show that ROA and LNSIZE are not statistically significant at customary levels. Consistent with Akhigbe et al. (2007), LEV is marginally significant (at 10% level) in model (3) and statistically significant (at 1% level) in model (4) with the expected signs. Consequently, there is little evidence which points to bank fundamentals explaining default risk in hi-capitalised banks. Finally, adjusted R^2 is higher (i.e., about 63.7%) in low total risk-based capital ratios than in well capitalised ones (i.e., about 54%). Therefore, one may argue that bank-risk fundamentals are more effective in explaining -DD in undercapitalised banks compared to highly-capitalised banks. Consequently, H3 is accepted.

4.6 Summary and Conclusions

This empirical chapter examines the extent to which bank fundamentals help predict market-based measures of default risk. Generally, by employing the distance to default approach, the analysis which generates some findings that support distance to default has higher predictive power for financial distress in sub-debt banks (H1). The explanation for that is the importance of private monitoring governance for uninsured bank creditors that issue subordinated debts. Sub-debt

increases the informational efficiency of bank risk fundamentals. It also finds that both higher charter value and lower bank capitalisation further increase the power of bank fundamentals to predict bank default risk. Another interesting finding is the methodological approach - an option pricing model employed to construct distance to default to measure for default risk is more useful than others in capturing information in sub-debt. Distance to default adds important information to the accounting data in assessing unhealthy banks by regulatory authorities.

The results have a number of important implications. First, the study is policy motivated - due to the fact that findings are consistent with the Basel II Framework and Gramm-Leach-Bliley's requirements. They support the infusion of greater levels of market discipline governance that enhances transparency and disclosures. As such, the issuance of bank sub-debt securities, improves the informational efficiency of bank risk fundamentals. Second, from the agent-principal perspective, subordinated debt holder monitoring governance is important in managerial incentives for greater risk-taking in banks. As a possible avenue for further research, the relationship between accounting risk information and distance to default uncovered in this study, can be tested in the context of other markets.

Table 4-1 Summary Statistics for SND Banks

Panel A reports descriptive statistics. The variable -DD is the distance to default. Equity volatility (σ_E) is calculated as the standard deviation of daily equity returns multiplied by the square root of the number of trading days in a year. Asset volatility (σ_A) is the volatility of asset returns based on the contingent claims model. Non-performing loans divided by total loans ratio denoted is denoted by NPLTL. RLLA is the ratio of reserve loan losses to total assets. Non-interest income divided by revenues is labelled as NIIR. Cash and marketable securities to total assets ratio denoted as CSD. Capital is denoted by CAP and defined as book value of equity to total asset. Total risk capital ratio is denoted by CART and defined as the sum of Tier 1 capital and Tier 2 capital divided by weighted risk assets. The ratio of total (book) liabilities to the book value of equity denoted as LEV. Return on assets is income before tax divided by total assets and labelled as ROA. Tobin's Q is denoted as Q and defined as market capitalisation plus total asset minus total equity divided total assets. Total liabilities to the sum of market value of common and book value of preferred stock ratio denoted as MKTLEV. ROALEV is the product of ROA and LEV. RLLALEV is the product of RLLA and LEV. *Control variable:* Total asset is denoted by TA. Natural log of total Assets (LNSIZE). Panel B presents means (medians) of bank risk fundamentals for comparisons of SND banks against non-SND banks for a sample of 226 US bank holding companies for the period 1998-2000. SND banks are defined as those BHCs that have issued mandatory sub-debt security in any single year over the sample period 1998-2007 and a non-SND bank had never issued this security.

Panel A: Descriptive statistics

	N	Mean	Median	Std Dev	Min	Max
-DD	906	-3.913	-3.618	2.096	-16.995	3.767
σ_E	906	0.385	0.298	0.438	0.066	6.848
σ_A	906	0.095	0.045	0.375	0.004	6.837
NPLTL (%)	874	0.671	0.559	0.582	0.000	5.623
RLLA (%)	874	0.946	0.899	0.370	.013	4.601
NIIR (%)	878	21.319	18.162	13.333	0.426	69.930
CSD (%)	905	1.455	0.461	2.185	0.000	1 .953
CAP (%)	906	8.956	8.494	5.620	1.241	92.200
CART (%)	906	12.262	12.260	1.241	5.920	23.700
LEV (Times)	906	11.310	10.753	3.914	0.085	79.611
ROA (%)	877	1.460	1.464	0.968	-4.648	14.665
Q	906	1.096	1.080	0.090	0.933	1.878
MKTLEV (Times)	906	6.684	5.466	5.584	0.050	88.295
ROAMKLEV (%)	877	15.725	15.910	8.462	-63.434	45.193
RLLAMKLEV (%)	874	10.657	9.581	7.860	0.147	198.323
LNSIZE	906	24.879	22.286	26.085	17.717	28.415
TA ($ billion)	906	63.800	4.770	213.000	0.050	2,190.000

Panel B: Comparison of SND banks and non-SND banks risk fundamentals

Item	SND banks	Non-SND banks	t-statistics (p-value for Welch test) for difference in mean (median)
Number of firms	98	128	
NPLTL (%)	0.671 (0.559)	0.678 (0.502)	-0.594 (0.2724)
RLLA (%)	0.946 (0.899)	0.893 (0.876)	3.267*** (0.000)
NIIR (%)	21.319 (18.162)	15.142 (14.437)	11.915*** (0.000)
CSD (%)	1.455 (0.461)	28.366 (27.056)	-76.220*** (0.000)
CAP (%)	8.956 (8.494)	9.636 (8.746)	-2.619*** (0.000)
CART (%)	12.262 (0.12.260)	12.790 (12.798)	-8.389*** (0.000)
LEV (Times)	11.310 (10.753)	10.584 (10.415)	4.634*** (0.000)
ROA (%)	1.460 (1.464)	1.474 (1.353)	-0.280 (0.610)
TA ($ billion)	63.800(4.770)	1,980 (1270)	-30.630*** (0.000)

***, ** and * indicate statistical significance at the level of 1, 5 and 10% respectively.

Table 4-2 Correlation matrix

The variable -DD labels the distance to default. Equity volatility denoted by σ_E and is calculated as the standard deviation of daily equity returns multiplied by the square root of the number of trading days in a year. Asset volatility labelled as σ_A and is the volatility of asset return based on a contingent claims model. The value of total assets, V_A ($ billion), is estimated based on option pricing methods. X is the book value of total liabilities at the end of each year ($ billion). Non-performing loans are divided by total loans and labelled NPLTL. RLLA is the ratio of reserve loan losses to total assets. Non-interest income divided by revenues ratio and labelled as NIIR. Cash and marketable securities to total assets ratio denoted as CSD. Total risk capital ratio is denoted by CART and defined as the sum of Tier 1 capital and Tier 2 capital divided by risky assets. The ratio of total (book) liabilities to the book value of equity denoted by LEV. Return on assets is defined as income before tax divided by total assets and labelled as ROA. Tobin's Q is defined as market capitalisation plus total asset minus total equity divided total assets. Control variable*:* Natural log of total Assets (LNSIZE).

Panel A: Correlation between distance to default and equity volatility, asset volatility, and total liabilities

Variable	-DD	σ_A	σ_E	V_A
σ_A	0.342*			
σ_E	0.613*	0.902*		
V_A	-0.161*	-0.034	-0.067*	
X	-0.151*	-0.03	-0.06	0.998*

Panel B: Correlation for bank risk measures and control variable used in regression models and variance inflation factor (VIF) tests between dependent variable (DD).

	DD	NPLTL	RLLA	NIIR	CSD	CART	LEV	ROA	VIF
DD									
NPLTL	0.156*								1.15
RLLA	0.202*	0.270*							1.15
NIIR	-0.233*	-0.016	-0.193*						1.51
CSD	0.075*	-0.099*	0.083*	-0.104*					1.07
CART	-0.031	-0.013	-0.001	0.097*	-0.053				1.03
LEV	0.155*	0.046	-0.055	-0.062	-0.023	-0.111*			1.09
ROA	-0.141*	-0.163*	0.150*	0.28*	-0.084*	0.037	-0.215*		1.27
LNSIZE	-0.332*	0.034	-0.054	**0.560***	-0.149*	0.014	-0.080*	0.254*	1.59

Asterisk * indicates that the test statistic is significant at the level of 5%

Table 4-3 Distance to default and subordinated debt

The underlying model is: $-DD=\beta_1+\beta_2 NPLTL_{t-1}+\beta_3 NIIR_{t-1}+\beta_4 CSD_{t-1}+\beta_5 CART_{t-1}+\beta_6 ROA_{t-1}+\beta_7 LEV_{t-1}+\beta_8 ROALEV_{t-1}+\beta_9 LLCR_{t-1}+\beta_{10} RLLA_{t-1}+\beta_{11} RLLALEV_{t-1}+\beta_{12} LNSIZE+\varepsilon_{it.}$

This table reports fixed effects panel regressions on the variable –DD. *Independent variables*: Non-performing loans divided by total loans ratio is denoted by NPLTL. Non-interest income divided by revenues is labelled as NIIR. Cash and marketable securities to total assets ratio denoted as CSD. Total risk capital ratio is denoted by CART and defined as the sum of Tier 1 capital and Tier 2 capital divided by weighted risk assets. Return on assets ratio is the income before tax divided by total assets and labelled as ROA. The ratio of total liabilities to the book value of equity denoted by LEV. ROALEV is the product of ROA and LEV. Loan-loss coverage ratio defined as pre-tax income plus provisions for loan losses to net loan losses, LLCR. RLLA is the ratio of reserve loan losses to total assets. RLLALEV is the product of RLLA and LEV. *Control variable:* Natural log of total Assets (LNSIZE). Year dummies are included in the fixed effect regressions. Estimated standard errors are computed using White's method. Heteroskedasticity consistent t-statistics reported in parentheses below each coefficient estimate. SND banks are defined as those BHCs that issued mandatory sub-debt, and non-SND banks are those that had not issued this security.

	SND banks					Non-SND banks
Variables/Model	(1)	(2)	(3)	(4)	(5)	(6)
Lag(NPLTL)	0.231**	0.248**	0.251*	0.092	0.054	0.274
	(2.088)	(2.239)	(1.948)	(0.460)	(0.270)	(1.211)
Lag(NIIR)	-0.006		-0.012	-0.016	-0.016	-0.019
	(-0.519)		(-0.906)	(-1.364)	(-1.352)	(-1.548)
NIIR_res.		-0.006				
		(-0.606)				
Lag(CSD)	0.062	0.072	0.159	0.062***		0.046**
	(0.992)	(1.144)	(1.582)	(3.857)		(2.360)
CSD_re					0.071***	
					(4.085)	
Lag(CART)	0.020	0.016	0.004	-0.033	0.127*	0.021
	(0.464)	(0.375)	(0.075)	(-0.539)	(1.897)	(0.293)
Lag(ROA)	0.174	-0.070	0.391	-1.115***	-0.713***	-1.207
	(0.874)	(-0.684)	(1.303)	(-2.663)	(-3.101)	(-1.058)
Lag(LEV)	0.086***	0.071***	0.030	0.011	0.092*	0.107
	(3.477)	(3.178)	(1.602)	(0.132)	(1.781)	(0.625)
Lag(ROALEV)	-0.021		-0.030	0.055		0.069
	(-1.436)		(-1.602)	(1.115)		(0.695)
Lag(LNSIZE)	-0.019	-0.033	-0.341	-0.236	-0.196	0.333
	(-0.101)	(-0.169)	(-1.459)	(-0.662)	(-0.547)	(0.728)
Lag(LLCR)			-0.000			-0.000
			(-0.995)			(-1.013)
Lag (RLLA)			0.966			0.345
			(1.011)			(0.312)
Lag(RLLALEV)			-0.028*			-0.108
			(-0.323)			(-0.832)
Constant	-4.453	-4.073	1.942	-3.922	-5.547	-17.008
	(-0.996)	(-0.916)	(0.346)	(-0.508)	(-0.721)	(-1.644)
R^2	0.565	0.563	0.587	0.675	0.675	0.687
Adjusted R^2	0.487	0.486	0.500	0.620	0.621	0.628
#Obs.	749	749	640	968	968	860

***, ** and * indicate statistical significance at the level of 1, 5 and 10% respectively. Welch test is used to check differences in coefficients of variables between SND banks and non-SND banks, and results are reported in Table 4-1.

Table 4-4 Robustness: differences-in-differences methodology

The table reports the sensitivity of distance to default to dSND. dSND takes the value of 1 if the bank issued mandatory sub-debt in any single year over the sample period 1998-2007, otherwise 0. Non-performing loans divided by total loans ratio is denoted by NPLTL. Residual of non-interest income divided by revenues is labelled as NIIR. Residual of cash and marketable securities to total assets ratio denoted as CSD. Total risk capital ratio is denoted by CART and defined as the sum of Tier 1 capital and Tier 2 capital divided by weighted risk assets. Return on assets ratio is the income before tax divided by total assets and labelled as ROA. The ratio of total liabilities to the book value of equity is denoted by LEV. Residual of ROALEV is the product of ROA and LEV. Residual of natural log of total assets (LNSIZERE). Year dummies are included in the fixed effect regressions. Estimated standard errors are computed using White's method. Heteroskedasticity consistent t-statistics reported in parentheses below each coefficient estimate.

	Dependent variable: Distance to default							
Variables/Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dSND	4.242***	4.109***	4.135***	4.138***	4.125***	4.126***	4.073***	4.076***
	(35.274)	(34.621)	(34.415)	(34.408)	(33.158)	(34.442)	(34.228)	(34.267)
PLTLN		0.346***	0.335***	0.349***	0.354***	0.267**	0.251**	0.290***
		(3.308)	(3.211)	(3.378)	(3.395)	(2.474)	(2.313)	(2.626)
NIIR			-	-	-	-0.014**	-0.015**	-0.014**
			0.018***	0.019***	0.019***			
			(-2.751)	(-2.802)	(-2.784)	(-2.294)	(-2.354)	(-2.226)
CSD				0.011	0.013*	0.009	0.006	0.006
				(1.644)	(1.693)	(1.260)	(0.830)	(0.855)
CART					-0.025	-0.047	-0.014	-0.007
					(-0.579)	(-1.107)	(-0.332)	(-0.173)
ROA						-	-	-
						0.559***	0.456***	0.834***
						(-5.815)	(-4.661)	(-6.410)
LEV							0.094***	0.050***
							(4.913)	(3.459)
ROALEV								0.052***
								(3.974)
LNSIZERE	-0.319***	-0.315***	-0.317***	-0.321***	-0.321***	-0.270***	-0.262***	-0.272***
	(-8.547)	(-8.496)	(-8.538)	(-8.648)	(-8.639)	(-6.881)	(-6.800)	(-7.012)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included
R^2	0.519	0.530	0.532	0.532	0.532	0.551	0.557	0.559
Adjusted R^2	0.517	0.527	0.529	0.529	0.528	0.547	0.553	0.555
#Obs.	2,063	1,998	1,998	1,996	1,996	1,938	1,938	1,938

***, ** and * indicate statistical significance at the level of 1, 5 and 10% respectively.

Table 4-5 Distance to default and bank risk fundamentals sorted by Tobin's Q

The underlying model is: $-DD=\beta_1+\beta_2 NPLTL_{t-1}+\beta_3 CSD_{t-1}+\beta_4 CAP_{t-1}+\beta_5 ROA_{t-1}+\beta_6 MKTLEV_{t-1}+\beta_7 ROAMLEV_{t-1}\beta_8 LNSIZE+\varepsilon_{it.}$

BHCs firms issuing SND over 1998-2007 are ranked on their Tobin's Q (Q, defined as market capitalisation plus total asset minus total equity divided total assets). The variable -DD labels the distance to default. *Independent variables*: Non-performing loans divided by total loans ratio denoted by NPLTL. Cash and marketable securities to total assets ratio denoted as CSD. Non-interest income divided by revenues ratio and labelled by NIIR. Total risk capital ratio is denoted by CART and defined as the sum of Tier 1 capital and Tier 2 capital divided by weighted risk assets. Return on assets ratio is the income before tax divided by total assets and labelled ROA. Total liabilities to the sum of market value of common and book value of preferred stock is denoted by MKTLEV. The ratio of total liabilities to the book value of equity denoted is by LEV. ROALEV is the product of ROA and LEV. ROAMKLEV is the product of ROA and MKTLEV. RLLAMKLEV is the product of RLLA and MKTLEV. dSND is the dummy variable takes the value of 1 if the bank issued mandatory sub-debt in any single year over the sample period 1998-2007, otherwise 0. *Control variable:* Natural log of total Assets (LNSIZE). Year dummies are included in the fixed effect regressions. Estimated standard errors are computed using White's method. Heteroskedasticity consistent t-statistics reported in parentheses below each coefficient estimate.

Variables	LOW:Q1	MEDIUM: Q2-Q4	HIGH:Q5	LOW:Q1	MEDIUM: Q2-Q4	HIGH:Q5
Variables/Model	(1)	(2)	(3)	(4)	(5)	(6)
Lag(PLTLN*dSND)	0.201	0.164	0.498	0.054	0.038	0.177
	(1.015)	(0.562)	(1.541)	(0.267)	(0.127)	(0.614)
Lag(CSD*dSND)	0.038	-0.046	0.506*	0.017	-0.080	0.558**
	(0.648)	(-0.378)	(1.958)	(0.315)	(-0.701)	(2.176)
Lag(CART*dSND)	-0.088	0.107	-0.065	-0.065	0.105	-0.085
	(-1.001)	(1.472)	(-0.726)	(-0.735)	(1.463)	(-0.911)
Lag(ROA*dSND)	0.064	-0.254	0.506	0.042	-0.235	-0.108
	(0.432)	(-0.725)	(1.206)	(0.376)	(-0.945)	(-0.465)
Lag(MKTLEV*dSND)	-0.000	0.009	0.309	-0.063*	-0.098	-0.365**
	(-0.003)	(0.130)	(1.671)	(-1.892)	(-1.486)	(-2.381)
Lag(ROAMKLEV*dSND)	-0.004	-0.009	-0.200*			
	(-0.752)	(-0.266)	(-1.730)			
Lag(LNSIZE*dSND)	-0.142	0.255	-0.205	-0.060	0.196	-0.111
	(-0.581)	(0.745)	(-0.338)	(-0.252)	(0.575)	(-0.213)
Lag(RLLAMKLEV*dSND)				0.066**	0.124*	0.424***
				(2.351)	(1.803)	(3.183)
Constant	-0.498	-9.838	-0.384	-2.406	-8.478	-1.201
	(-0.100)	(-1.304)	(-0.027)	(-0.491)	(-1.125)	(-0.095)
R-squared	0.462	0.550	0.682	0.473	0.550	0.699
Adj. R-squared	0.393	0.534	0.654	0.406	0.533	0.672
#Obs.	134	427	188	134	424	187

***, ** and * indicate statistical significance at the level of 1, 5 and 10% respectively.

Table 4-6 Distance to default sensitivity and capital adequacy for SND Banks

The underlying model is: $-DD=\beta_1+\beta_2 NIIR_{t-1}+\beta_3 CAP_{t-1}+\beta_4 ROA_{t-1}+\beta_5 RLLA_{t-1}+\beta_6 LEV_{t-1}+\beta_7 RLLALEV_{t-1}+\beta_8 LLCR_{t-1}+\beta_9 LNSIZE+\varepsilon_{it.}$

The table presents the influence of bank risk fundamentals risk and distance to default in subsamples split in low- and high-cap banks on the basis of total capital risk ratio. The low-cap subsample banks are defined as banks below the median of total risk capital ratio (i.e. 12.260%) and high-cap subsample are banks equal or above this ratio. *Dependent variable:* Distance to default regression are estimated over 2003-2007 for above and below-median portfolios of capitalisation. *Independent variables:* Residual of non-interest income divided by revenues is denoted by NIIR. Return on assets (ROA) is income before tax divided by total assets. RLLA is the ratio of reserve loan losses to total assets. LEV is total liabilities to the book value of equity. RLLALEV is the product of RLLA and LEV. Loan-loss coverage ratio is defined as pre-tax income plus provision for loan losses to net loan losses (LLCR). *Control variable:* Natural log of total assets (LNSIZE). Year dummies are included in the fixed effect regressions. Estimated standard errors are computed using White's method. Heteroskedasticity consistent t-statistics reported in parentheses below each coefficient estimate.

	Low capital ratio effect < median		High capital ratio effect >= median	
Variables/Models	(1)	(2)	(3)	(4)
Lag (NIIR_res)	-0.103***	-0.107***	-0.006	-0.016*
	(-2.709)	(-2.959)	(-0.526)	(-1.674)
Lag (ROA)	0.541	0.322	-0.079	-0.112
	(1.470)	(1.132)	(-0.688)	(-1.003)
Lag (RLLA)	0.855		1.545	
	(0.242)		(1.432)	
Lag (LEV)	0.130	0.113**	0.152*	0.078***
	(0.467)	(2.156)	(1.746)	(2.818)
Lag (RLLALEV)	0.017		-0.070	
	(0.061)		(-0.849)	
Lag (LLCR)	-0.001	-0.001*	-0.0003	-0.0004
	(-1.530)	(-1.806)	(-0.817)	(-1.047)
Lag (LNSIZE)	-2.092**	-2.158**	-0.499	-0.491
	(-2.344)	(-2.442)	(-1.454)	(-1.400)
Constant	42.457**	45.702**	5.426	6.756
	(2.098)	(2.348)	(0.695)	(0.846)
R-squared	0.665	0.662	0.555	0.552
Adj. R-squared	0.636	0.637	0.540	0.539
#Obs.	176	177	467	470

***, ** and * indicate statistical significance at the level of 1, 5 and 10% respectively.

Appendix I. Bank Risk Fundamentals

Variable	Definition
NPLTL (%)	Non-Performing loans to total loans
RLLA (%)	The ratio of reserve loan losses to total assets
ROA (%)	Profit before interest and tax divided by book value of assets
NIIR (%)	Non-interest income divided by revenues
CSD (%)	Cash and marketable securities to total assets ratio
CAP (%)	Book value of equity to total asset
CART (%)	Sum of Tier 1 capital and Tier 2 capital divided by weighted risk assets.
LEV (times)	Total (book) liabilities to the book value of equity
Tobin's Q	Market capitalisation plus total asset minus total equity divided total assets
MKTLEV (%)	Total liabilities to the sum of market value of common and book value of preferred stock ratio
ROALEV (%)	The product of ROA and LEV
RLLALEV (%)	The product of RLLA and LEV
RLLALEV (%)	The interaction of RLLA and MKTLEV
ROAMKLEV (%)	The interaction of ROA and MKTLEV

Chapter 5: Corporate Governance and Bank Risk-Taking Behaviour

5.1 Introduction

The purpose of this chapter is to extend Chapter 4 and investigate the effectiveness of corporate governance on the bank risk-taking. It questions whether board and ownership structure governance jointly drives risk-taking that could affect bank stakeholders' value. Little work has been carried out on this topic, in spite of its importance for the banking industry (Laeven and Levine, 2009; Pathan, 2009). Motivated by excessive risk-taking and bank failures and aware of the features specific to banking firms, regulators, researchers and practitioners have given increased attention to the link between corporate governance and bank risk. Bearing these considerations in mind, this empirical study attempts to offer better understanding of how corporate control mechanisms influence risk-taking activity in banks.

Therefore, the main thrust of this investigation, assumes bank governance is in place. It examines the tension between board and ownership structure and bank risk-taking. In other words, does board and ownership governance lead to risk-taking behaviour in banking firms? The key empirical findings can be summed up as follows: First, the empirical evidence indicates that board and ownership governance influence bank risk-taking. In particular, managerial ownership negatively influences capital to assets and non-performing loans ratios. After controlling for non-linear form, non-performing loans ratio increases in managerial ownership. There are three plausible explanations for these findings. One, ownership structure governance is designed to maximise the value of equity options (Galai and Masulis, 1976; Merton, 1977). Yet, achieving this goal through increasing risk-taking can be affected by both managers' preferences and by restrictions imposed by regulators.

Two, when managers are entrenched and their substantial stock holdings are exposed to greater risk, they will engage in less risky strategies – i.e. adopt lending behaviours that enable them to maintain their positions and enjoy their firms' perquisites. In this scenario, managers may maintain good quality loan portfolios

while ensuring their banks are well capitalised. On the other hand, if managerial interests are tied more closely to those of shareholders, managers will take on more risky lending activities; potentially deteriorating the quality of credit portfolio and bank capital status. A final explanation could be board of directors' non-compliance with prudential regulations due to lack of supervision, collusion between bank insiders and regulators, or corruption. As such, non-conformity should be attributed to imprudent lending decisions. For instance, Horiuchi and Shimizu (2001) contended that collusion in the banking sector led to the Japanese safety net becoming unstable.

Second, capital to assets and non-performing loan ratios are negatively associated with board size. Therefore, these findings clearly suggest that smaller boards impair bank capital position. An alternative view is that insiders are reluctant to enhance their shareholdings. In this model, larger boards might be the appropriate agency conflict monitoring device to preserve banks' capital requirement. However, smaller boards pay attention to ensure that banks maintain good asset quality status, along with the decline in non-performing loans. Again, for capital to assets, non-performing loans, and liquid assets ratios, the percentage of independent directors is as would be expected. This parameter registers positively in capital to assets and liquid assets ratios, and negatively in non-performing loans ratio. From these results, it seems logical that independent directors played their monitoring role to shape excessive bank risk-taking. In fact, this prediction is consistent with the risk-averse and corporate control hypotheses. Indeed, independent directors may be aware of the bank risk profile, are experienced members, pay attention to regulatory compliance issues, or hold insignificant wealth in the bank. Collectively, this suggests that the prudential tools and institutional settings are structured to mitigate risk-taking behaviour[46].

Third, contrary to expectations, managerial ownership impacts on liquidity ratio specifications positively. With this prediction, the following speculations emerge. One, for safeguarding the stability of the banking system, managers have in place short and long term liquidity risk strategies that help to curb bank liquidity disruptions. For example, banks may be holding sufficient liquid assets to avoid runs. Two, banks' liquidity is not a focus for regulatory agencies and legislators. In this sense, it was not given much attention by bank regulatory agencies.

Fourth, the percentage of institutional ownership has a positive relationship with the capital to assets ratio. This explains the importance of institutional investors in ensuring minimum capital requirements are in place. Again, there is some evidence that the percentage of institutional investors impacts positively in non-performing ratio regression. Consistent with finding by Laeven and Levine (2009), this relationship highlights that, in part, institutional investors tend to risk lending activities. Fifth, board size is negatively associated with bank risk-taking ex-ante Sarbanes and ex-post Sarbanes-Oxley Act of 2002 and Regulation A. This finding indicates that decisions of larger boards could be effective and less extreme in liquidity risk management – or overall bank asset-liability management frameworks ex these regulatory reforms. Generally, the results presented in this empirical chapter indicate that board and ownership influence bank risk.

The theoretical literature is normally focused on the premises that corporate governance is designed to align shareholders' interests – i.e. maximise the value of shareholders' equity, with those of the management. Empirical evidence that considers the impact of control mechanisms for corporate governance on banking firms' risk behaviour produces mixed result. There is supporting evidence that risk and managerial risk sensitivity (through ownership) are associated – see Saunders et al. (1990), Anderson and Fraser (2000), and other successors including a recent paper by Laeven and Levine (2009). Indeed, the main finding in this research is a strong link between ownership structure and risk. The relation between institutional ownership, board structure and bank risk-taking has received far less attention (Staikouras et al., 2007; Elyasiani and Jia, 2008; Akhigbe and Martin, 2008; Pathan, 2009)[47]. Table 2-2 reports the findings of a selection of bank risk and board structure empirical evidence.

This investigation departs from prior work in a different way. It proxied bank risk by using bank balance information – i.e. capital to assets, non-performing and liquid assets ratios. They capture capital adequacy, credit risk and bank quality of assets portfolio, and liquidity risk, respectively. These regulatory indicators are not only important to managerial decisions and business policy issues, but also, they are not yet fully tested along with agency problem control mechanisms. Bank regulatory agencies and legislators closely focus on capital adequacy and mandatory asset

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[46] Examples of prudential regulations include capital adequacy, asset quality, management capability, earnings ability, and liquidity management.

choice restrictions to monitor excessive risk-taking (John et al., 1995)[48]. Furthermore, the findings for board and ownership structure on bank risk are statistically significant and are robust after controlling for multicollinearity, endogeneity, survivorship bias, and heteroskedasticity.

This chapter makes five major contributions to the existing study. First, while there is a substantial empirical study examining managerial ownership on risk-taking for financial firms, the understanding of board and ownership structure on bank balance sheet risk measures is yet to be examined. To my knowledge this is the first investigation not only assessing the influence of board and ownership structure governance on bank risk, but also its reflection on capital adequacy, asset quality and liquidity position. A thorough review of the bank board literature found only three papers which connected board structure and risk (Staikouras et al., 2007; Akhigbe and Martin, 2008; Pathan, 2009). In fact, various control forces work well together in influencing firm governance and resolving agency related-risks. In effect, the interaction of external and internal governance mechanisms may work together to downsize agency costs in corporate firms (Cremers and Nair, 2005). Nevertheless, many researchers considered at least one element of corporate governance from a bank risk-taking perspective (see Tables 2-1 and 2-2). This empirical analysis found that the multiple usage of board and ownership structure governance impacts on risk-taking behaviour in banks.

Second, since there is limited academic research into the association between board structure and bank risk, this investigation adds to the literature by documenting that board structure governance is a significant aspect in bank risk-taking. More specifically, strong board (small board size) and bank risk proxies are negatively related. Third, the sensitivity of board and ownership structure in different classes of banks based on risk-taking incentive is analysed - i.e. large banks against small banks. Consistent with the preceding results, board size and

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[47] Consistent with the theoretical prediction, Cheng (2008) shows those smaller boards drive risk-taking for corporate firms.

[48] Recently, bank liquidity risk has also been placed on the global agenda subsequent to September 11, the global financial crisis and the ongoing Euro debt crisis. In response to these episodes, the Basel Committee on Banking Supervision (2008) has published a Liquidity Risk Management and Supervisory Challenge to ensure that banks continue to meet their outstanding commitment at reasonable costs. As liquidity risk is a major threat to the banking sector, sufficient liquidity (i.e., liquid assets in the form of cash and marketable securities) cannot be emphasised enough for safety and soundness of the financial system in this empirical experiment. For example, see http://www.londonsummit.gov.uk/en/summit-aims/communique-explanation/ for the real action agreed on and other steps to be taken.

managerial ownership remain as valuable monitoring mechanisms in complex banks with regard to risk-taking. Analysing complex and large firms, Coles et al. (2008) argue that complex firms - that are large, diversified and highly leveraged, have greater advising and monitoring needs – consistent with the efficient monitoring hypothesis set forth by Dalton et al. (1999).

Fourth, comparison of bank risk-taking behaviour and board structure ex-ante and ex-post Sarbanes enactment and Regulation A in the 2003 amendment is somehow overlooked. The theory advanced by Jorgensen and Kirschenheiter (2003) is that with mandatory risk disclosures, firms are expected to exhibit high risk. Analysing board characteristics and risk-taking patterns over the two regimes, board size is an indispensable characteristic as per Sarbanes enactment. Finally, the chapter sheds some light on the debate over policy issues related to bank governance - i.e. the necessity of a majority of independent directors in boards. Given the findings in this empirical chapter, a rethink and possible new direction in governance monitoring devices is imperative in banking institutions. By adopting sound corporate governance, excessive bank risk-taking might be brought to an acceptable level. Consistent with contributions in this study, two evident empirical questions remain open: Whether board and ownership governance drives bank risk-taking. And the policy-oriented question - as to whether this investigation casts some light about corporate governance in banking firms.

This chapter is organised as follows. Section 5.2 discusses the theoretical literature. Section 5.3 develops the hypotheses. Section 5.4 introduces the sample and discusses the methodology. Section 5.5 presents empirical results. Section 5.6 carries out and show further diagnosis tests and Section 5.7 concludes the empirical chapter.

5.2 Theoretical Motivation

Economic theories tested in this empirical chapter are generally based on the principal-agent framework (Jensen and Meckling, 1976). Managers and shareholders have different preferences in regard to risk. With banks, the agency framework assumes that shareholders can enhance the value of call-option (Galai and Masulis, 1976) and put-option (Merton, 1977) by increasing the risk of the underlying assets of the bank. Indeed, risk-averse managers might be induced to undertake risky corporate investment policies preferred by shareholders. The

agency-model based literature of board and ownership governance are structured to represent shareholders' interests that maximise their wealth - the convergence of interests hypothesis. When good corporate governance is in place, agency theory predicts a definite tension between mechanisms to control agency conflict and risk-taking.

In this context, Jensen and Meckling (1976) and John et al. (2008) have proposed that in agency theory, risk-taking increases as a function of ownership structure. Another competing hypothesis is managerial entrenchment set forth by Stulz (1988). In an entrenched environment of weak corporate governance, agency theory predicts that insider ownership levels and firm performance are negatively correlated. With this managerial self-serving, manager may engage in risk-reducing investing and financing decisions (Smith and Stulz, 1985). In turn, the entrenchment hypothesis supports the value-destroying effect and exacerbates the agency risk.

The theoretical corporate governance literature also looks at board structure – i.e. the primary internal control mechanism. Jensen's (1993) work offers a conceptual foundation on the board of directors' responsibilities - i.e. monitoring, advising, hiring, firing and managing executive compensation schemes. He recommended a smaller board over a larger one as an efficient monitoring mechanism. To date, theoretical work identifies monitoring and advising as the key functions for boards (Hermalin and Weisbach, 1998; Raheja, 2005; Adams and Ferreira, 2007; Harris and Raviv, 2008). It documents that a smaller board (strong board) effectively monitors managers' behaviour that aligns their interests with shareholders, but this can increase risk-taking (Cheng, 2008). Together, the theoretical research proposes three board characteristics that could lead to maximisation of shareholders' value - i.e. board size, independence and leadership.

In this conceptual framework, the popular views suggest that smaller and a majority of independent directors on boards are better (Jensen, 1993; Yermack, 1996). Accordingly, board size and firm performance should be negatively related, suggesting that communication or coordination problems and agency conflicts are exacerbated by larger boards. The percentage of independent directors and firm performance should be positively associated - consistent with the view that the addition of even one independent director improves firm performance. In this perspective, smaller boards and more independent directors are expected to monitor managers, which, in turn, downsize the level of bank risk. However, the

opposite direction can be predicted in a moral hazard environment where bank shareholders have higher incentives for greater risk-taking.

Finally, in agency theory, external ownership structure - institutional investors with larger shareholdings, on average, have greater managerial monitoring incentives. Shleifer and Vishny (1986) predict that large shareholders with substantial equity-holdings – i.e. blockholders and institutional investors, will lead to better firm performance – and thus, positively influence corporate value. Primarily, the motive for well-diversified portfolio institutional investors is to monitor managers rather than entrenchment or information traders.

In banks, the prediction of corporate control and information asymmetry hypotheses for the relationship between institutional ownership and risk is not clear (Cebenoyan et al. 1995). With the efficient monitoring hypothesis (Dalton et al. 1999), therefore, the association between institutional shareholdings and bank risk is expected to be negative. With this prudent-man theory, institutional investors offer managerial monitoring a second layer. Yet, under the moral hazard environment of deposit insurance large shareholders, institutional investors, have more incentives to engage in bank risk-taking strategies (Saunders et al., 1990; Demsetz et al., 1997; Laeven and Levine, 2009). As such, these are two competing theories with regard to the connection between the percentage of institutional ownership and bank risk.

5.3 Hypotheses Development

5.3.1 Testable Hypotheses

Following theoretical arguments explored in this study, this section develops a set of testable hypotheses as formulated on the basis of bank risk-taking. Then, risk measures are related to the corporate governance framework to explore the effect of ownership and board characteristics on bank risk-taking behaviour.

5.3.2 Does managerial share ownership influence bank risk-taking?

Based on the principal-agent model, agency conflicts exist between managers and shareholders. Where there is broad dispersion of shareholders, owners are unable to oversee managerial self-serving behaviours. The ownership structure is one of

the governance aspects that reduces the effect of this agency problem (Demsetz, 1983). Thus, risk-taking may be sensitive to ownership structure (Jensen and Meckling, 1976; John et al. 2008; Laeven and Levine, 2009). From this theoretical foundation, one may, therefore, expect that as the managerial ownership grows, agency conflicts decrease, and managerial risk-taking incentives more closely align to those of shareholders - leading to firm performance improvement.

Prior empirical studies listed in Table 2-1 report a summary of research into the ownership structure. Findings relating to the association between equity ownership composition and bank risk-taking are consistent with this theory of ownership structure[49]. These empirical papers have identified a strong positive link between insider ownership and risk, consistent with the managerial risk-taking hypothesis. In this vein, it is argued that an increase in managerial ownership translates into value-maximisation of shareholders via greater risk-taking as proposed in the corporate control hypotheses (Jensen and Meckling, 1976).

Gorton and Rosen (1995) investigate the effects of entrenchment and economic condition shifts on the relationship between ownership structure and risk. They report that the non-performing loans ratio is strongly positively and negatively connected to insider ownership and insider ownership squared, respectively. In addition, they show that insider ownership and insider ownership squared impact negatively and positively, and they are significant in the equity-to-assets ratio. Moreover, they indicate that the non-performing loans ratio and return on asset are positively related to outside blockholders, respectively.

In contrast to earlier studies, Laeven and Levine (2009) report a strong negative association between cash flows and z-score, as shown by Cebenoyan et al. (1995) and Sullivan and Spong (1998). Gorton and Rosen (1995), Knopf and Teall (1996) and Sullivan and Spong (1998) indicate that equity to total assets ratio is negatively related to insider shareholding, suggesting that greater risk-taking resulted in a weaker capital position. One may argue that, increasingly, non-performing loan portfolios, reserve loan losses, or huge losses realisation may adversely have an impact not only on the quality of asset portfolios and profitability of banks, but also, the capital status. If this pattern persists, it may threaten bank insolvency - i.e.

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[49] Among others include research by Saunders et al., (1990) Knopf and Teall (1996), Demsetz et al. (1997), Sullivan and Spong (1998), Anderson and Fraser (2000), Horiuchi and Shimizu (2001), Lee (2002), Staikouras et al. (2007), and Laeven and Levine (2009).

increased liquidity risk. On the other hand, Sullivan and Spong (1998) show that insider ownership and net loans losses to total loans are negatively related.

Based on these highlighted arguments, the following are predicted: First, the measure of capital adequacy was equity-to-total asset ratio, CAP - and, it will decrease in managerial ownership and trend up in managerial ownership squared. Second, asset quality and asset portfolio risk indicators were measured by the non-performing loans ratio, NPLTL. The increase pattern is expected for the non-performing loans ratio function. Finally, liquidity risk was measured by liquid asset ratio, CSD. This variable is predicted to decrease in managerial ownership. If managers act in the best interests of the shareholders for value-maximising when their shareholdings increase gradually, it is expected that shareholders will gain through greater risk-taking. This leads to the first hypothesis related to managerial ownership and risk-taking divided into three parts:

H1a: A negative association will exist between managerial ownership and capital-assets ratio.

H1b: A positive association will exist between managerial ownership and non-performing loans ratio

H1c: A negative association will exist between managerial ownership and liquidity asset ratio.

5.3.3 Does institutional investor ownership influence risk-taking?

The literature listed in Table 2-1 presents the connection between institutional ownership and risk. In financial firms, the prediction between institutional ownership and risk measures is conflicting. Cebenoyan et al. (1995) show a positive and significant relation between institutional ownership and the capital-to-assets ratio. Knopf and Teall (1996) indicate that institutional shareholdings and thrift industry risk (measured by equity return variability and real estate to total asset ratio) are negatively related. Together, these papers indicate that institutional investors are a disincentive to risk-taking activities in depository institutions. However, Demsetz et al. (1997) report a negative association between capital to assets ratio and large blockholdings. By contrast, in Japanese banks, Konishi and Yasada (2004) highlight a U-shaped association between risk-taking and institutional ownership

stability – that is, a non-linear relationship. Finally, Laeven and Levine (2009) show that z-score is negatively related to the activity restrictions index when large shareholders are present in boards. On the other hand, Gorton and Rosen (1995) report that non-performing loans increase with external blockholders.

Elyasiani and Jia (2008) indicate a positive relationship between institutional ownership stability and BHC performance. A possible explanation for this significant association is increasingly evident in shareholdings by institutional investors in BHC firms. Prior to GLBA, institutional investors had less equity in banking firms relative to manufacturing firms. Taken as a whole, the above research evidence supports the efficient monitoring contention. Others document no relation between institutional ownership and bank performance (Pi and Timme, 1993). Yet, in these prior findings, the strength between institutional ownership and bank risk is not only limited and mixed, but also, remains an empirical question.

From the above discussion, it is argued that as institutional investors hold well diversified portfolios, they have greater incentives to monitor managerial bad behaviour. In effect, with this sufficient diligent second layer monitoring tool, institutional investors can shape managerial actions that impair the maximisation of the call-put option values of bank shareholders' equities. Consequently, an inverse relationship is predicted between institutional ownership and bank risk (i.e., non-performing loans, the capital to assets, and the liquidity asset ratios). By contrast, under the government protection coupled with stockholder controlled banks, the prediction may be the opposite - as these incentives decrease risk-aversion in institutional investors. Assuming the monitoring effect dominated, the second hypothesis related to institutional investor shareholding and balance sheet risk measures is divided into three parts:

H2a: A positive association will exist between institutional ownership and capital-assets ratio.

H2b: A negative association will exist between institutional ownership and non-performing loans ratio.

H2c: A positive association will exist between institutional ownership and liquidity asset ratio.

5.3.4 Does board structure influence bank risk-taking preferences?

A. Board size and risk-taking

The literature listed in Table 2-2 reports a summary of research into board structure. The board of directors is essentially responsible for monitoring and advising top executive officers in a bid to ensure the best interests of shareholders are safeguarded. According to Jensen (1993), the smaller board is a better agency control mechanism, despite the fact of its inherent greater extreme decision-making. Little is known about the connection between board size and bank risk. Staikouras et al. (2007) indicate that loans to total assets and equity to total assets ratios are significant and negatively related to board size. Pathan (2009) shows a strong negative tension between the governance of board structure (board size) and risk. In contrast, Horiuchi and Shimizu (2001) reveal a negative relation between amakudari and bank risk in Japanese banks. The negative coefficient estimate on board size supports the better smaller boards foundation supposition elucidated in Yermack (1996) for monitoring managers and representing the interests of shareholders. Consistent with the view at complex firms – i.e. highly leveraged firms have greater advisory needs - bank performance increases in relation to board size (see Adams and Mehran, 2003; Andres and Vallelado, 2008). This association is atypical in the board structure literature.

The contentions above suggest that the relevance of board size on bank behaviour is unclear - but smaller boards are better. If a smaller board of directors effectively monitors bank managers' behaviour to align it with shareholders' interest, then owners will benefit from that smaller board, but it can increase risk (Cheng, 2008; Pathan, 2009). Subsequently, bank managers may engage in excessively risky corporate decisions that do not enhance the firm's convex payoff – or not maximising shareholders' wealth. In effect, if smaller boards accentuate bank risk taking, capital to assets and liquidity asset ratios are predicted to decrease in relation to board size. Non-performing loans ratio is expected to increase with board size. These arguments lead to the third proposed hypothesis related to board size and bank risk-taking divided into three parts:

H3a: A negative association will exist between board size and capital to assets ratio.

H3b: A negative association will exist between board size and non-performing loans ratio.

H3c: A negative association will exist between board size and liquidity asset ratio.

B. Board independence and risk-taking

From Table 2-2, both empirical research and the theoretical view, propose that the dominance of independent directors on boards boosts effective monitoring and corporate performance. On the other hand, studies show that there is no link between board independence and bank performance (Pi and Timme, 1993; Adams and Mehran, 2005; Akhigbe and Martin, 2006; Staikouras et al., 2007). This research evidence does not generalise to indicate that independent directors are irrelevant in monitoring banking firm behaviour. Pathan et al. (2007) report a strong and positive link between bank performance and board independence. Two papers indicate that board independence and market risk are negatively connected (Akhigbe and Martin, 2008; Pathan, 2009). In contrast, Staikouras et al. (2007) indicates a positive association between the extent of board independence and risk (measured by loans to total assets ratio). One could, therefore, argue that, if independent directors are better monitors of bank managers' opportunistic behaviour to conserve their reputation, bank risk-taking will decrease.

Based on heightened concerns, a dominance of outside directors on boards is preferred for independent efficient monitoring. However, their effectiveness on banking behaviour is ambiguous. Given this discussion, in more independent boards, managers may take on and exhibit moderate risk behaviour, even in an environment of moral hazard. Thus, building on Akhigbe and Martin (2008) and Pathan (2009) research evidence, there should be the following relationships: Board independence will increase in the capital to asset and the liquidity asset ratios and will decrease in the non-performing loans ratio. Accordingly, the above arguments lead to the fourth hypothesis related to board independence and risk-taking also divided into three parts:

H4a: A positive association will exist between board independence and capital to assets ratio.

H4b: A negative association will exist between board independence and non-performing loans ratio.

H4c: A positive relationship will exist between board independence and liquidity asset ratio.

5.3.5 Effect of board structure on bank balance sheet risk: Sarbanes-Oxley Act of 2002 and Regulation A in 2003

Literature on Sarbanes fuelled by the high profile scandals at Enron and other high profile corporate firms put the emphasis on a board structure largely composed of independent directors. Prior to these regulatory mandates, boards had been inefficiently monitoring managers, and are thus blamed for corporate business failures (Adams, 2009). While the Sarbanes legislation was intended to promote firms' governance and to enhance transparency, Regulation A counteracts excessive risk-taking incentives. Akhigbe and Martin (2008) demonstrate a significant negative effect on risk and corporate governance for US financial services firms, following Sarbanes enactment.

From the above views, if the Sarbanes-Oxley Act is adopted and implemented accordingly by banks, opacity of financial statements will decrease and boards will have more incentive to constrain risk-taking behaviour. The same effect will be true for Regulation A of 2003 in mitigating bank risk. However, in theory, mandatory risk disclosure could lead to greater market risk (Jorgensen and Kirschenheiter 2003). Consequently, ex-post under these mandatory regimes the total loan losses ratio and z-score (bank risk measures) are expected to decrease in board governance. Hence, these legal and regulatory reforms combine to make the fifth testable hypothesis related to board structure and risk-taking in a stringent environment:

H5a: There is a negative association between board size and bank risk, ex-post Sarbanes-Oxley Act and Regulation A of 2003.

H5b: There is an inverse association between the percentage of board independence, ex-post Sarbanes-Oxley Act and Regulation A of 2003.

5.4 Data and Methodology

5.4.1 Sample selection and methodology

Data and the sample selection were discussed in Chapter 3. The construction of the variables, and more definitions used in this analysis, can be found in Appendix II. Therefore, this section starts by discussing the primary risk dependent variables. The section also discusses explanatory variables and control variables.

A. Risk measures

The main dependent variables include capital to assets, non-performing loans and liquid assets ratios. These balance sheet risk indicators have been used in prior empirical studies to proxy risk-taking in financial firms (Gorton and Rosen, 1995; Martinez-Peria and Schmukler, 2001; Staikouras et al., 2007, among others). While the capital to assets-ratio captures fluctuation in bank capital adequacy, the non-performing ratio captures credit risk and ascertains bank quality of assets. Liquid assets ratio is important in measuring and controlling for bank liquidity risk.

A. Empirical specification

Following Saunders et al. (1990), Gorton and Rosen (1995) and Horiuchi and Shimizu (2001), to investigate the link between bank risk and board and ownership structure, the empirical model specification is as follows:

$$Risk_{it} = \alpha + \beta_1 INSOWN + \beta_2 INSOWNQ + \beta_3 INSTOWN + \beta_4 BDSIZE + \beta_5 FINBD + \beta_6 LNSIZE + \beta_7 Time.Dummy + \varepsilon \quad \text{..... (5.1)}$$

where Risk is represented by capital to assets, non-performing loans and liquid assets ratios measures defined in Appendix II. The primary interest centres on the coefficient estimates of managerial ownership (β_1), managerial ownership squared (β_2), institutional ownership (β_3), board size (β_4) and board independence (β_5). A negative estimate of managerial ownership (β_1) on the capital to assets ratio is consistent with the hypothesis that the increase in managerial ownership leads to risk-taking and thus reduces capital level. A positive estimate of managerial

ownership squared (β_2) on the same risk indicator supports the hypothesis that capital regulations reduce bank risk-taking incentives as owners are forced to increase their stockholdings (Laeven and Levine, 2009). Along with the efficient monitoring hypothesis, an inverse relationship is predicted between institutional ownership (β_3) and risk.

Negative estimates of board size (β_4) on capital to assets, non-performing and liquid assets ratios refer to the relevance of smaller boards in highlighting bank-risk taking. Positive coefficient estimates of independent directors (β_5) on the capital to assets and the liquid assets ratios indicate independent directors' incentives to shape bank risk-taking behaviour. This is true for a negative coefficient estimate of independence board (β_5) on non-performing ratio. Finally, the regression models include two control variables to measure other sources of ex-ante heterogeneity. Bank size, LNSIZE (β_6) and year dummy variables are included to control for possible risk asset diversification, information asymmetry, bailouts in larger banks and time effect, respectively. As the sample is composed of small and large BHCs, the predicted effect on risk measures can be either negative or positive. Return on assets is included to control for profitability on banks risk where, *i* and *t* represent the bank and time, respectively.

5.4.2 Summary statistics

Table 5-1 shows some of the key descriptive statistics incorporated in this analysis. The average mean and median values of book value of capital to total asset ratio are 16.23% and 13.01%, respectively. They are substantially higher than the regulatory benchmark for well-capitalised banks. Well-capitalised banks are required to maintain 5%, 6% and 10% of tier 1 leverage, tier 1 risk-assets based and total risk-based capital minimal ratios, respectively. On average, the sample used in this empirical chapter consists of well-capitalised BHCs. The mean and median values for the non-performing to total loan ratio is 0.78% and 0.55%, respectively. These ratios are higher than those of 0.59% and 0.46% reported by Akhigbe et al., (2007). This may be attributed to differences in the sample sources - Akhigbe et al., (2007) examined commercial banks. This investigation focuses on bank holding companies. The mean and median values for the liquid assets ratio are 5.66% and 4.14%, respectively.

The average mean value for percentage managerial ownership is 16%. This value is considerably higher than that found in US studies, with Booth et al., (2002) eliciting an average mean value of 5.77%, and Elyasiani and Jia (2008) producing one of 13.857%. The average mean value for percentage institutional ownership is 15%. This is substantially lower than that reported by Elyasiani and Jia (2008). These differences may be due to sample period differences, as well as variations in managerial ownership definitions. Average mean and median values of board size are quite close, with 12 and 11 members respectively.

The mean value of board size is similar to that reported by Pathan (2009) of 12.92 members. In contrast to other studies in the banking sector, Booth et al. (2002) documented a higher mean value of 16.3 board members in the 100 banks with the largest total assets. Adams and Mehran (2005) indicated a mean value of 18 board members. Andres and Vallelado (2008) found mean values of 15.203 and 15.780 for board size in the US and pooled commercial banks in six countries, respectively. Larger boards reported in the above studies can be explained by the massive merger and acquisitions wave in the banking sector during the late nineties. Another plausible explanation for larger boards in bank holding companies relative to industrial firms is the structure of the boards for the BHCs. Some of the subsidiary banks' board members are also members of a lead BHC. For example, in non-financial firms, the following mean values of board size have been provided: Yermack (1996) - 12.25; Rosenstein and Wyatt (1997) – 11; Vafeas (1999) - 11.77; Andres et al. (2005) - 11.67; Coles et al. (2008) – 10.4, and Linck et al., (2008) - 7.5.

The percentage of independent directors displays a mean value of 76%. This value is considerably higher than that reported by Booth et al. (2002) of 58%, and Pathan (2009) of 64.52% in the US banking sector. One may argue that higher board independence reported in this chapter is due to the provisions of Sarbanes and self- regulatory organisations (SROs) that require publicly traded firms to have larger numbers of board members in the aftermath of well publicised corporate scandals. Prior to these mandatory regulations, more independent directors had not been seen as a priority.

Table 5-2 presents pair correlations between explanatory variables at a 5% level of significance. The percentage of managerial ownership is statistically significant with respect to its negative correlation with board size and proportion of

independent directors. The same is true for institutional ownership and board characteristics. The largest correlation is 0.661, between institutional ownership and blockholder ownership, and there is a correlation of 0.516 between the percentage of managerial ownership and blockholder ownership. The percentage of managerial ownership and board size are also highly correlated with firm size - 0.376 and 0.433, respectively. Institutional ownership is negatively correlated with the proportion of independent directors (0.081). Blockholder ownership is significantly negatively correlated, with both board size and proportion of independent directors. From this pair of negative correlations, one may, therefore, contend that characteristics of board and ownership are substitutes for controlling agency conflicts between managers and shareholders. Because of this, there is a sense that corporate governance control mechanisms are endogenously determined (Agrawal and Knoeber, 1996; Beiner et al., 2006). However, board size is significantly positively related to the proportion of independent directors.

To control for the multicollinearity problem in the regression analysis, several tests are conducted. First, in each regression model, variance inflation factors (VIF) are estimated. Across all model specifications, the reported VIFs of firm size or board size are below 2. Essentially, in this empirical chapter analysis, VIFs are at acceptable levels, suggesting that the multicollinearity among independent variables is not problematic. According to Gujarati (2003), the acceptable conventional VIF is 10. Second, orthogonal variables represented by the residual values from regressions of the natural log of firm size or board size factors on each other are generated. These values are used as regressors. Moreover, managerial ownership and the natural log of bank size variables correlated at 0.376 are orthogonalised. Third, according to Anderson et al. (2004), board size is redefined as the number of board size divided by the natural log of firm size. This new variable is used in regression analysis instead of board size.

5.5 Empirical Results

5.5.1 Capital adequacy, asset quality, liquidity and corporate governance

This empirical chapter tests the relationship between bank risk measures and corporate governance. It models risk on board and ownership characteristics, and control variables. The risk surrogates are provided as capital to total asset, CAP,

for capital adequacy; non-performing loans ratio, NPLTL, for asset quality; and cash and marketable securities to total assets, CSD, for liquidity risk.

A. Ownership characteristics and bank risk fundamentals

Table 5-3 presents the results of primary specification using equation (5.1) for testing hypotheses H1 to H4. Along with models (1)-(3) and H1a, residual managerial ownership, INSOWNRE is significant in explaining capital adequacy (as measured by capital-to-asset ratio) at 1% or better level of significance – i.e. they are negatively associated. This finding is consistent with those in Gorton and Rosen (1995), Knopf and Teall (1996), and Sullivan and Spong (1998), and the view advocated by Saunders et al. (1990) that substantial managerial shareholdings lead to greater bank risk-taking. Hence, the result suggests that an increase in managerial ownership to a certain level will reduce the capital level and jeopardise its status. One may interpret this association as suggesting that increases in managerial ownership act as a countermeasure to the effectiveness of those prudent capital regulations intended to discourage greater risk-taking behaviour. Accordingly, with risk-taking incentives, managers behave in the best interests of shareholders (Jensen and Meckling, 1976), as the effect of a convergence of interests overwhelms the private consumption/perks dominated behaviour.

Controlling for the coefficient of squared value of managerial ownership, INSOWNQ is never significant in models (2) and (3). Yet, residual managerial ownership remains with earlier prediction sign. Negative and significant estimate of INSOWNRE on capital to asset ratio does not support the hypothesis that capital regulations reduce bank risk-taking incentives as owners are possibly hesitant to enhance their stockholdings. The increase in bank ownership puts shareholders' wealth at greater risk, which in turn reduces the incentives for them to pursue risky policies. This result suggests that bank entrenched managers who may be otherwise averse to greater risk-taking are more likely to select risky strategies once their shareholdings increase. Consequently, this excessive risk-taking behaviour by insiders might put bank capital adequacy at more risk, thus leading to insolvency. Factoring in the risk-taking behaviour function in capital-to-asset ratio, the result is compatible with the view that linear managerial ownership increases bank risk through capital adequacy decline. Hence, these results are consistent with H1a and it is supported.

For models (4)-(6) and along with hypothesis H1b, asset quality is predicted by the percentage of non-performing loans ratio, NPLTL. In linear regression model (4), the relationship between the residual managerial ownership and non-performing loans is negative and significant (at 5% level). For models (5) and (6), the coefficient estimates on INSOWN and INSOWNQ are negative and positive, respectively, and are significant at a level of 10% or better. The risk-taking behaviour function in non-performing loans ratio models is U-shaped. First, risk in the loan portfolio declines in managerial ownership as the entrenchment effect dominates the positive convergence effect. Thereafter, it increases significantly (at 5% level) in managerial ownership level as convergence and asset substitution become significant motivating factors. These findings are inconsistent with those reported by Gorton and Rosen (1995) and Sullivan and Spong (1998). However, a positive sign on INSOWNQ explains managerial convergence and risk-taking effects at the higher managerial ownership level. From this pattern and, consistent with the risk-taking hypothesis, bank managers whose interests are closely aligned with those of shareholders will seek risky lending activities that increase the magnitude of risk in the credit portfolios.

The lesson of these results is that, managers with insignificant share levels have no incentive to select risky lending strategies, as reflected by the coefficient estimate on INSOWN in model (4). However, they can engage in these risky activities once their shareholdings increase to maximise shareholders' and their own wealth.

Solving quadratic equations for the level of managerial ownership values that maximise the percentage of non-performing loans ratio are 50% and 22.5% in models (5) and (6), respectively. These turning point values are greater than the mean value for managerial ownership (15.85%). However, values are comparable to the value of 24.5% found in US thrifts by Cebenoyan et al. (1995). There are two possible explanations for this. One, the latter study does not control for board characteristics. Including these variables might have driven the findings. Two, the differences in regulatory financial sector environment may also have a role in this variation. In this sense, banks with managerial ownership over the 22.5-50% mark are more likely to pursue excessive risk-taking. Saunders et al. (1990) and Lee (2002) classified such banks as 'stockholder-controlled' banks. These results indicate that an increase in managerial ownership exacerbated the quality of asset portfolios of banks. It would seem that one lesson to be drawn from these results is

that as managerial ownership increases; bank managers have incentives to select risky asset portfolio investments. These findings are consistent with the existing empirical results and positions provided in Saunders et al. (1990), Anderson and Fraser (2000), and Laeven and Levine (2009), among others. Therefore, hypothesis H1b holds.

Models (7)-(9) depict the impact of managerial ownership on liquidity risk (measured by liquid asset ratio, CSD). In the linear regression model (7), the relationship between residual managerial ownership and liquid assets ratio, INSOWNRE is positive and significant (at 1% level). After allowing for a possible nonlinear association, the tension between the residual managerial ownership squared, INSOWNQRE and liquid asset risk ratio is negative and statistically significant, at better than 1% with an inverted U-shape in models (8) and (9). That is, liquidity asset ratio emerges as nonlinear as a function of managerial ownership. Initially, liquidity assets ratio increases at a low level of managerial ownership, before trending downwards at a higher level when managers are entrenched. The positive signs, on managerial ownership, indicate a high bank liquidity position.

One reason is that, to keep banking operations on going, managers maintain sufficient liquidity to guarantee immediate withdrawals and any outstanding loans in the short-term. Moreover, managers are responsible for the bank liquidity situation so as to ensure the safety and soundness of the banking system. A high liquidity rating for a bank is also important as it confirms the bank's avoidance of market discipline (Peria and Schmukler, 2001; Demirgüç-Kunt and Huizinga, 2004). Examples of market discipline (presented in Chapter 4) include higher interest rates on core deposits, capital withdrawal, or unwinding positions prior to a bank run. Healthier cash positions may lead managers to smooth out banking operations and minimise the probability of a bank run or a systematic failure. In addition, this finding casts doubts on the recent debate over liquidity risk in banks. In general, hypothesis H1c is not supported.

For model (10), overall bank risk (measured by z-score) is linked to board and ownership structure. The residual managerial ownership, INSOWNRE and managerial ownership squared, INSOWNQ positively and exponentially influence z-score. This evidence is supportive of a risk-decreasing effect of insider shareholdings. It implies that as insiders' personal wealth becomes concentrated, the likelihood of bank survival increases, that is, default risk is rendered more remote. Alongside this, it may be argued that bank managers are sceptical about

excessive risk-taking once their substantial wealth is being exposed to higher risk. This finding is consistent with those in Cebenoyan et al. (1995), Sullivan and Spong (1998), and Pathan (2009)[50]. Residual board size and z-score are negatively associated, at 5% level of significance in model (10). Such results though, stand in direct contrast to the theoretical prediction and prior empirical evidence (Pathan, 2009).

As noted for non-performing loans ratio, models (5) and (6) and for liquid assets ratio, models (7)-(9), the connectivity between natural log of firm size and z-score is positive and significant at 10% level. This finding is consistent with that indicated by the three above papers. In this sense, banks with larger assets have higher distance to default. In addition, the positive association between return on asset, ROA and z-score indicates that stable banks are more profitable. The results of the survival likelihood index are robust and add support to the impact of board governance (board size) on the bank risk-taking.

In line with hypothesis H2a-c and across all models (1-9), institutional investors have had an impact on the bank's capital adequacy and asset quality. Consistent with Cebenoyan et al. (1995), capital to assets ratio is positively related to the percentage of institutional ownership in models (1)-(3). However, these findings are inconsistent with those reported by Demsetz et al. (1997) who shows an inverse relationship between large blockholdings and capital to assets ratio. The evidence presented can be explained as follows. For capital adequacy: institutional investors devote efforts to ensure that banks' capital regulations are complied with and banks are not threatened with insolvency. In contrast, it may be argued that if institutional investors play their monitoring role, they will ensure banks hold sufficient capital for unforeseen risks.

Consistent with Gorton and Rosen (1995), the percentage of institutional ownership impacts positively on the non-performing loans ratio, model (4). With this marginal negative effect of institutional investors on credit portfolio (at 10% level of significance), it cannot be directly construed that institutional investors may have failed to play their dual role of monitoring and activism. Yet, the multiple institutional investors' incentives seen in their investing in banks should be recognised. With these varied stimuli, they might prefer to take risks. As such, these diverse

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[50] Pathan (2009) reports a positive relationship between the percentage of shares owned by the CEO and z-score.

motivations could drive the tension between institutional ownership and bank risk fundamentals in either direction. A point worth noting is that, given this evidence and the recent increase in institutional shareholdings, it is evident that institutional investors' presence affects bank risk. Studies by Demsetz et al. (1997), Konishi and Yasada (2004), and Laeven and Levine (2009) have highlighted that institutional investors incentivise risk-taking activity in banking firms. With regard to liquidity risk, the coefficient of the percentage of institutional ownership, INSOTWN is never significant on liquid asset ratio, models (7)-(9). Hence, while H2a is accepted, H2b and H2c are rejected. Accordingly, this connection is further analysed.

B. Board characteristics and bank risk

A significant negative link of residual board size, BDSIZERE, with all measures of bank risk measures at better than 10% level across all models can be observed. More specifically, small boards increased the extent of risk in the credit portfolios (i.e., worsen non-performing loans). The small board also reduced the capital position and increased fluctuations in the liquidity position of banking firms. As a whole, these findings go with the supposition that small boards not only worsen banks' asset quality, but also aggravated their capital adequacy and liquidity status. Collectively, the findings are consistent with those in Staikouras et al. (2007) and Pathan (2009) for banks and in Cheng (2008) for corporate firms. Consequently, this empirical evidence is unable to reject hypothesis H3a-c – that board size and bank risk fundamentals are negatively related.

Therefore, negative coefficient estimates of board size on capital to assets, non-performing and liquid assets ratios refer to the relevance of a smaller board in escalating bank-risk. Based on these findings, it may be contended that as the board size in the bank declines, the capital to assets ratio decreases, non-performing ratio increases, and liquidity risk decreases, therefore indicating a rise in risk. In general, strong boards of a small size can make more extreme decisions that possibly may exacerbate agency conflicts in banking firms.

The percentage of independent directors is positively associated with the capital to assets ratio in model (3), at better than 5% level. This result is supportive of the board monitoring role in banks in maintaining sufficient capital. Therefore, it may be considered logical that independent directors in banks not only align the interest of shareholders, but also paying attention to banks' compliance risk management

guidelines prerequisite may be a priority. In this perspective, they ensure that banks are not violating any law, legal and regulation related to banking business. From these results, it can be seen that independent directors are an important component of board structure governance and have been responsible for addressing issues of capital adequacy of banks rather than provoking risk-taking behaviour. Therefore, hypothesis H4a is supported.

For the non-performing loans ratio, the percentage of independent directors carries a negative sign with a significant coefficient in model (6) at better than 1%. It can be argued, as above, that independent directors may have a twin-role in respect to risk-taking in banks, by striking a balance between the interests of shareholders and other multi-constituency stakeholders. From these results, the idea appears to be that the board composition is largely composed of outsiders. These independent directors not only understand banking operations and complex financial services, but also the bank risk management framework. More important, the findings across independent directors and bank risk-taking (i.e., capital to assets and non-performing loans ratios) support the theoretical prediction of the principal-agent model. Hence, hypothesis H4b is supported.

Focusing on model (9), a positive and significant link is detected between the percentage of independent directors and liquid asset ratio (at 5% level). There are two plausible explanations for this. First, independent directors would not have underestimated the fragility of bank liquidity. As such, they manage and monitor managers to ensure sufficient liquidity is in place all the time. Second, independent directors are important in prioritising and ranking bank liquidity risk. All told, hypothesis H4c is accepted, thereby proposing that independent directors are essential for bank liquidity. Thus, independent directors may be a driving force in controlling bank liquidity risk.

Collectively, the findings suggest that an increase in board independence monitoring and advisory responsibilities improves capital adequacy, liquidity position and reduces the chances of credit risks. And, these results are consistent with those reported by Akhigbe and Martin (2008) and Pathan (2009), and Cheng (2008) for industrial firms. However, they are inconsistent with those of Horiuchi and Shimizu (2001), who highlighted that Amakudari reduced capital adequacy levels and led to the deterioration in credit portfolio quality in Japanese banks.

In terms of control variables, the coefficient estimate for the natural logarithm of total assets is marginally negative on capital-to-asset, in model (1). This is contrary to expectations. It may be argued that well-capitalised banks have a larger asset size. In models (5) and (6), bank size impacts positively on the performing loans ratio. This pattern indicates that large and complex banks have made more risky loans which may have resulted in poor asset quality. Other risk measures - liquidity assets ratio and asset size are positive and significant at the 1% level in models (7)-(9). This positive relationship suggests that large banks maintain sufficient liquid assets (i.e., cash and marketable securities). There are two possible explanations for this. One, this result is consistent with the conjecture that liquidity is important during capital market problems. Two, they reflect the results in Dahlquist and Robertson (2001) which show that foreign investors prefer large firms with high cash deposits on their balance sheets. As expected, return on asset is positive in capital-to-asset ratio. This suggests that realised profit is reinvested to enhance tier 1 capital. In liquid asset ratio, return on asset is negative.

Finally, a number of post estimation tests were performed. Wald test (*ll*) for the joint significance of year dummies control variable is statistically significant at better than 1% level (p=0.000)[51]. These results show that macroeconomic conditions and banking sector differences in the institutional framework also play a significant role in bank risk-taking behaviour. Therefore, these tests validate their inclusion in the model specification. The adjusted -squares are between 0.052 and 0.16. These are on the low side, but close to those found in comparable empirical work in the US (see Gorton and Rosen, 1995; Knopf and Teall, 1996). To correct for heteroskedasticity and serial correlation, the chapter employs White's (1980) heteroskedastic-consistent standard error in regression analysis (models (1)-(9)). The *t*-value and standard error are corrected by clustering observations within each bank. Finally, at the end of each regression analysis, VIF test is performed. The highest reported VIF is less than 2, which falls within the benchmark of 10. With this evidence, it can be stated that multicollinearity is not an issue in this empirical analysis.

Generally, results indicate two emerging and important issues. Board makeup and ownership structure governance are important factors in bank risk-taking

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[51] In the presence of multicollinearity that would have threatened regressions analysis, Stata automatically drops one of the highly correlated variables – i.e. one of the year dummy variables is dropped in each regression model.

behaviour. Based on this, board and ownership governance provides solution to agency conflicts in banking firms.

5.5.2 Additional multicollinearity checks

Board size and bank size are highly correlated (i.e., at 0.433). On this basis, the chapter uses various techniques to mitigate the multicollinearity concern and further explore the above hypotheses. Using three approaches, the above analysis in Table 5-3 is revisited. If the connection between board and ownership characteristics continues to exhibit itself in the same way with regard to balance sheet risk - this offers additional support for the belief that board and ownership structure governance are significant in bank risk-taking. Results are reported in Table 5-4. First, board size and bank size are orthogonalised. Accordingly, after controlling for orthogonalised board size (BDSIZERE) and bank size (LNSIZE) in models (1-3), coefficient estimates of managerial ownership, managerial ownership squared, board size and the percentage of independent directors carry similar prior signs and levels of significance.

Second, along with Anderson et al. (2004), board size is redefined as the number of board directors divided by natural log of total asset ratio, BDLNSIZE. Again, in models (4) and (5), BDLNSIZE estimate is negative and supports the hypothesis that smaller boards enhance bank risk-taking as noted in Table 5-3. Coefficient estimates on residual managerial ownership, managerial ownership squared and percentage of independent directors also remain robust. Moreover, the test for VIF indicates that their means are less than 2 in models (4-6). In general, using these additional multicollinearity tests, the interpretation of the findings is still similar to those presented in Table 5-3.

Finally, to provide further robustness in the assessment of multicollinearity concerns, 146 large banks sorted by Tobin's Q and located in the top quintiles, Q4-Q5, are analysed. The results of this subsample are reported in Table 5-5. Consistent with the prior findings, board size remains negatively associated with non-performing loans in model (5) and is significant at 5% levels. The interpretation of board size coefficient remains qualitatively the same as in Table 5-4. For liquid assets ratio, the coefficient estimates on board size is positive and significant at the 10% level, in model (6). This result is consistent with the advisory role played by

larger boards in complex firms. In this context, larger boards can make important decisions that improve bank liquidity. In complex industrial firms, Coles et al. (2008) show that the relation between corporate value and board size is positive - attributed to larger boards.

In comparison with prior findings, the percentage of independent directors retained the same levels and is significant in the non-performing loans and liquidity ratios. This prediction adds support to hypothesis, H4c. In this subsample, it may be logical to assume that the above association attempts to answer the survivorship bias. This is because the 146 bank subsample used in this analysis is available for the entire investigation period.

5.5.3 Impact of board structure on risk: mandatory legislations

To examine the effect of board structure on bank risk before the Sarbanes-Oxley Act of 2002 and Regulation A of 2003, two subsamples 2000-2002 and 2003-2005 are created. The main focus is on the coefficient estimates of board size and board independence, ex-post mandatory legislations. The findings are reported in Table 5-6. This table outlines the comparison of regressions for the total loan losses ratio and z-score on board structure governance. It is immediately evident that board size is a bank risk motivating characteristic in both regimes. The coefficient estimates on board size in models (1)-(4) were negative, and significant at 5% level or better. This finding is comparable to that in Table 5-3 with regard to greater risk-taking that endangers banks' asset quality as well as capital status. In addition, it provides support for the idea that smaller boards are not only an important factor of board governance ex-ante-Sarbanes, but also ex-post Sarbanes and Regulation A. Hence, H5a is accepted that subsequent to the Sarbanes-Oxley Act (2002) passage and Regulation A reform, small board size increased bank risk. Throughout the regression models, the coefficient of independent directors is insignificant. Therefore H5b is not supported.

5.6 Robustness Checks

This section carries out a string of further tests to deal with numerous economic and econometric issues – i.e. endogeneity biases, Glejser's (1969) heteroskedasticity and other tests. It uses alternative risk measures to investigate

the possibility that other risk proxies are influenced by the board and ownership structure. Findings remain robust throughout this battery of checks.

5.6.1 Endogeneity bias

Since board and ownership characteristics are available simultaneously, they are likely to be jointly determined with bank risk measures, hence, paving the way to complexity analysis. The effect of this mechanism to control agency conflict on firm performance varies. This is because every characteristic has different benefits and cost in its usage, and their interaction could also impact firm risk differently. Therefore, to rectify the possibility that these variables are endogenously determined, a simultaneous equations model, using three-stage-least-squares (3SLS) methods, is estimated (Beiner et al., 2006). In the 3SLS estimations, the board and ownership structure governance equation consists of INSOWN, BDSIZE, or FINBD as endogenous variables, and capital-to-assets ratio or non-performing loans ratio are simultaneously determined variable. This approach considers each risk proxy as endogenous together with three governance control mechanisms. Empirically, this leads to two different systems of simultaneous equations.

The system of equations consists of four endogenous and seven exogenous variables. In each system board and ownership structure, and risk measures are dependent on each other. In theory, to meet order conditions for identification in this system, each equation must exclude at least three of the exogenous variables as each equation consist of three endogenosus variables. Thus, in constructing a four-equation framework, these identification settings are observed. To estimate the 3SLS system, the following set of previously used instrumental variables was selected (as in Agrawal and Knoeber, 1996; Mak and Li, 2001; Davies et al., 2005; Beiner et al., 2006) as AGE, TENURE, ROA, VOLATILITY, LNSIZE TAGR, and NYSE.

To validate the usage of the above procedure, the endogeneity bias of the board and ownership control mechanisms and risk were checked by employing an instrumental variables estimator. This estimator was proposed by Wooldridge (2004) and it involves two stages. One, dependent variable risk measure (i.e., capital to assets ratio or non-performing loans ratio), where board and ownership characteristics are each regressed on all exogeneous variables. Next, the respective residual values of the balance sheet risk and board and ownership control mechanisms are estimated. Two, these values are added to the original

equations and ordinary least square equations are estimated. A significant positive (negative) coefficient estimate on predicted value suggests the presence of the board and ownership structure being endogenous. For contrasting purposes, instrumental variables regressions were run in Stata, Version 11.2. Indeed, endogeneity checks for risk proxies for every board and ownership characteristic by applying the Durbin-Wu-Hausman (DWH) test were performed. Subsequent to the implementation of the Hausman command, a *t*-test that the null hypothesis of no endoegeneity is rejected – as the governance control mechanisms were jointly significant at 1%.

In Table 5-7, findings for potential endogeneity biases of bank risk measures and corporate governance are presented using 3SLS method estimation. Despite the fact that the results revealed are very robust and remain statistically significant with the predicted signs - an endogeneity problem is addressed. Put differently, this investigation documents a causal association between board and ownership control mechanisms and bank risk measures. But more importantly, managerial ownership, INSOWN is significantly negative and positive with capital to asset, CAP and non-performing loans ratios, NPLTL (at 1% level), respectively. Board size impacts on model (1) negatively and significantly (at 1% level), consistent with the popular notion of smaller boards. The proportion of independent directors influences positively in this regression model. For comparability, as noted in Table 5-3, coefficient estimates on managerial ownership and board size are the same. However, board characteristics are insignificant in the non-performing loans ratio regressions.

For models (2) and (6) associated with managerial ownership, the negative and positive signs on board size support substitution and complementary hypotheses, respectively (see Mak and Li, 2001). The substitution hypothesis advocates that firms substitute between control mechanisms to mitigate agency problems between managers and owners. The percentage of independent directors enters model (2) positively and significantly (at 1% level), signifying a complementary hypothesis. However, in this interdependence of monitoring systems, independent directors are vulnerable to high information asymmetry in carrying out their responsibilities.

Model (4) related to the percentage of independent directors, managerial ownership and board size enter positively - suggesting the complementarity effect (as in Beiner et al., 2006, for board size). Comparing estimators 3SLS (depicted in models 1-8) and OLS (presented in models 9-10), the former estimator indicates

higher coefficient estimates of board and ownership characteristics over the latter. Roughly a 10-20 times increase is noted. As argued by the literature, this not only confirms the causality, but also suggests the presence of the endogeneity bias[52]. However, for non-performing loans ratio regressions, board and ownership characteristics are insignificant. Generally, these results show that the relation between bank board and ownership structure governance is either a substitution or complementarity with regard to bank risk-taking.

5.6.2 Glejser's (1969) heteroskedasticity and more tests

Building on Cheng (2008) and Pathan (2009) work, Glejser's (1969) heteroskedasticity test is performed. Two stages are involved. One, residuals from the pooled-linear estimation of regressions are derived. The dependent variable are return on asset, ROA and reserves loan losses ratio, RLLA that capture bank profitability and uncertainty, respectively. Two, absolute values for return on asset and the reserves loan loss to total loans ratio residuals are obtained above. The generated absolute values residual values, û, are regressed for each of the two risk proxies in models (1) and (2) of Table 5-8 on board and ownership characteristics. The latter are hypothesised to be related to the bank risk measures modelled in equation (5.2).

$$\hat{u}_{it} = \alpha + \beta_1 INSOWN + \beta_2 INSOWNQ + \beta_3 INSTOWN + \beta_4 BDSIZE + \beta_5 FINBD + \beta_6 LNSIZE \quad (5.2)$$

Panel A of Table 5-8 presents the second stage results of Glejser's (1969) heteroskedasticity test for return on assets, and reserves loan loss to total loans ratio. An F-test of the hypothesis – that all slopes equal zero – is a test of the null hypothesis of homoscedasticity, against the alternative that bank risk is a function of board and ownership characteristics and control variables. To test whether a particular measure of power, *i*, affects bank risk, the t-test for the null $\beta_i=0$ is used. A high t-statistic indicates that a particular measure of *i* is related to bank risk, after controlling other variables.

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[52] See Agrawal and Knoeber (1996), Mak and Li (2001), Durnev and Kim (2005), and Beiner et al. (2006) for this comparison.

The R^2 values are 3.7% and 11.4%, and The Wald test statistics are 1.94 and 5.73 for the absolute value of return on asset, and the reserves loan loss to total loans ratio, respectively. To test for multicollinearity among the independent variables, the mean variance inflation factors (MVIFs) are 1.4 and 1.39, respectively - they are on the low side. These results substantiate the thesis that inclusion of board and ownership structure is fundamental in explaining bank risk models. Coefficient estimates on managerial ownership and board size carry the expected signs. In model (2), residual managerial ownership affects positively absolute values of reserves loan losses ratios (at better than 1% level of significance), consistent with that reported by Sullivan and Spong (1998). This is also true for absolute values of return on assets. Thus, the interpretation remains the same. Overall, the results were validated by Glejser's (1969) heteroskedasticity test.

To provide a further robustness check, the analysis introduced many control variables in the structural model. These variables included leverage, profitability and a dummy LNSIZEDU. A dummy variable LNSIZEDU is created to replace bank size. It takes 1 if LNSIZE is greater than the median for all firms, otherwise 0. The results are reported in models (3) through (4) in Table 5-8 panel B. The findings in this panel also confirm the main result that board and ownership characteristics influence bank-risk-taking.

5.7 Summary and Conclusions

This study has investigated whether corporate governance systematically influences bank risk-taking behaviour, through a sample of 301 BHCs between 2000 and 2005. The evidence presented in this chapter is consistent with the risk-taking hypothesis. Using bank balance sheet risk measures, the analysis indicates that board and ownership structure governance affect bank risk-taking - i.e. capital to assets, non-performing loans and liquid assets ratios. Results showing overall bank risk and board structure governance provide additional support on bank risk-taking (Laeven and Levine, 2009; Pathan, 2009, among others). These results remain robust throughout a number of tests. The percentage of independent directors and risk measures are negatively related. This prediction can be explained by arguing that the independent director not only represents the interests of bank shareholders, but this also extends to other constituents, and is consistent with principal-agent model.

Moreover, confirmation was also sought regarding whether banks' risk-taking and board structure was not pronounced *ex-ante* the Sarbanes-Oxley Act (2002) of 2002 and *ex-post* the Sarbanes and Regulation A of 2003. The empirical chapter reports that smaller board is an essential element of board governance ex-ante Sarbanes and ex-post Sarbanes and Regulation A legislations. Generally, consistent with the contracting environment, the findings reveal that the risk-taking behaviour of banks is a conduit in which a form of governance is effective on bank risk-taking behaviour. Most importantly, findings for H1-H4 re the association between smaller boards and bank balance sheet risk characteristics are stronger. Finally, this empirical chapter offers an extension of the agenda to cover policy implications related to corporate governance and bank risk-taking.

Appendix II. Bank risk measures and board and ownership characteristics

Variables	Definition
Dependent variables: Bank risk measures	
Capital adequacy	
Capital to assets ratio, CAP (%)	Book value of capital to total asset (financial leverage) ratio
Asset quality	
Non-performing loans ratio, NPLTL (%)	Non-performing loans to total loans
Liquidity risk	
Liquid assets ratio, CSD (%)	Liquid assets divided to total assets
Independent variables	
Corporate governance	
INSOWN (%)	Managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors
BDSIZE (numbers)	The total number of board of directors on board
FINBD (%)	Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size.
INSTOWN (%)	Percentage of ordinary shares held by institutional investors based on common equity shares under voting control
BLOCK (%)	Percentage of shares held by blockholders with greater than 5% ownership of banks' outstanding shares
Control variables	
LNSIZE (%)	Natural logarithm of total assets of the bank, a proxy for bank size
Year dummy	D2000-D2005 captures intertemporal variations in market conditions, tax effect and institutional framework effect

Table 5-1 Sample Summary Statistics

This table presents *dependent variables* for bank risk exposure, $Risk_{it}$ proxies*:* Capital adequacy is defined as book value of capital to total asset ratio, CAP. Asset quality refers to non-performing loans ratio defined as non-performing loans to total loans, and denoted as NPLTL. Liquid assets ratio is defined as cash and marketable securities to total assets CSD. *Independent variables:* Managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors and is denoted as INSOWN. Institutional ownership variable is defined as percentage of ordinary shares held by institutional investors based on common equity shares under voting control and is denoted as INSTOWN. Blockholders ownership is a percentage of shares held by institutions or individuals with greater than or equal to 5% ownership of the shares outstanding, and is labelled as BLOCK. Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. *Control variable:* Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Natural logarithm of total assets labelled as LNSIZE.

	N	Mean	Median	Std Dev	Min	Max
Panel A: Risk proxies						
CAP (%)	1,765	16.232	15.013	6.548	3.760	97.025
NPLTL (%)	1,779	0.778	0.552	1.027	0.000	19.525
CSD (%)	1,590	5.662	4.141	5.097	0.374	64.500
Panel B: Corporate governance						
INSOWN (%)	1,766	15.867	11.259	13.911	0.055	86.966
INSTOW (%)	905	14.910	10.683	13.732	0.063	95.797
BLOCK (%)	1,347	22.618	16.200	18.109	5.012	95.797
BDSIZE (number)	1,766	11.996	11.000	4.179	4.000	33.000
FINBD (%)	1,766	75.825	78.571	13.734	20.000	96.000
Panel C: Control variable						
ROA (%)	1,727	1.384	1.404	0.718	-10.549	6.479
LNSIZE	1,807	21.185	20.787	1.699	16.338	28.033
TA ($ billion)	1,807	18.844	1.055	107.127	0.012	1,494.037

Table 5-2 Correlation matrix

This table presents the pair correlation between variables. Managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors and is denoted as INSOWN. Institutional ownership variable is defined as percentage of ordinary shares held by institutional investors based on common equity shares under voting control and is denoted as INSTOWN. Blockholders ownership is a percentage of shares held by institutions or individuals with greater than or equal to 5% ownership of the shares outstanding, and is labelled as BLOCK. Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. *Control variables:* Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Natural logarithm of total assets labelled as LNSIZE.

	INSOWN	INSTOW	BLOCK	BDSIZE	FINBD	TENURE	LNSIZE_
INSTOWN	-0.048						
BLOCKOW	**0.516***	**0.661***					
BDSIZE	-0.123*	-0.033	-0.090*				
FINBD	-0.184*	-0.081*	-0.212*	0.146*			
TENURE	0.034	-0.036	0.053	0.013	-0.054*		
LNSIZE	**-0.376***	0.044	-0.021	**0.433***	0.026	-0.007	
ROA	-0.170*	-0.021	-0.038	-0.001	0.003	0.090*	0.309*

Asterisk * indicates statistical significance at the level of 5%.

Table 5-3 Bank risk measures, board and ownership structure

Dependent variables: Capital adequacy is defined as book value of capital to total asset ratio, CAP. Asset quality refers to non-performing loans ratio defined as non-performing loans to total loans, and denoted as NPLTL. Liquid assets ratio is defined as cash and marketable securities to total assets CSD. Return on assets plus capital asset ratio divided by variability of asset returns, and is labelled as z-score. *Independent variables:* Residual managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors and is denoted as INSOWNRE. INSOWNQ is the squared value of managerial ownership. INSOWNQRE is the squared value of residual managerial ownership. Institutional ownership variable is defined as percentage of ordinary shares held by institutional investors based on common equity shares under voting control and is denoted as INSTOWN. Residual board size is total number of board of directors on board denoted as BDSIZERE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. *Control variables measures:* Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Natural logarithm of total assets labelled as LNSIZE. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

								Balance sheet risk measures		Overall risk measure
			CAP			NPLTL			CSD	z-score
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
INSOWNRE	-0.163***	-0.164***	-0.166***	-0.012**	-0.010*	-0.009*	0.028***	0.025**	0.030***	0.022***
	(-2.856)	(-2.902)	(-2.947)	(-2.139)	(-1.855)	(-1.775)	(2.666)	(2.552)	(2.927)	(3.497)
INSOWNQ		-0.0001	0.0001		0.001**	0.0002**				0.0002***
		(-0.168)	(0.125)		(2.133)	(2.082)				(4.265)
INSOWNQRE								-0.002***	-0.002***	
								(-2.996)	(-3.092)	
INSTOWN	0.047**	0.045**	0.047**	0.004*	0.002	0.001	0.001	0.004	0.006	-0.001
	(2.149)	(2.059)	(2.160)	(1.679)	(0.604)	(0.349)	(0.060)	(0.370)	(0.497)	(-0.481)
BDSIZERE		-0.100**	-0.119***		-0.034***	-0.026***		-0.054*	-0.064**	-0.023***
		(-2.332)	(-2.807)		(-3.051)	(-2.879)		(-1.726)	(-1.968)	(-4.532)
FINBD			0.036**			-0.013***			0.019**	0.002
			(2.120)			(-3.008)			(1.974)	(0.908)
ROA	2.811***	2.693***	2.668***	-0.098	-0.090	-0.088	-0.675**	-0.730**	-0.742**	0.458***
	(4.557)	(4.343)	(4.319)	(-1.188)	(-1.073)	(-1.050)	(-2.205)	(-2.391)	(-2.441)	(8.643)
LNSIZE	-0.250*	-0.241	-0.232	0.014	0.065***	0.062***	0.617***	0.767***	0.767***	0.023*
	(-1.760)	(-1.633)	(-1.583)	(0.736)	(2.673)	(2.654)	(3.828)	(4.362)	(4.378)	(1.723)
Constant	14.714***	14.828***	11.839***	0.626	-0.623	0.460	-6.274*	-9.414***	-10.831***	-5.573***
	(4.660)	(4.449)	(3.475)	(1.461)	(-1.069)	(0.934)	(-1.960)	(-2.677)	(-2.900)	(-15.391)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
R-squared	0.116	0.120	0.125	0.026	0.114	0.134	0.063	0.073	0.076	0.174
Adj. R-squared	0.106	0.108	0.112	0.015	0.102	0.121	0.052	0.060	0.062	0.161
Wald test	8.45***	7.30***	7.14***	1.19	2.80***	2.82***	6.42***	4.97***	4.38***	19.80***
II: F-test	4.57***	4.21***	4.18***	6.51***	6.58***	6.44***	3.21***	3.59***	3.72***	0.51
#Obs.	800	800	800	796	796	796	805	805	805	769

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 5-4 Risk measures, orthogonalisation, and board size to natural log of total assets ratio

Dependent variables: Capital adequacy is defined as book value of capital to total asset ratio, CAP. Asset quality refers to non-performing loans ratio defined as non-performing loans to total loans, and denoted as NPLTL. Liquid assets ratio is defined as cash and marketable securities to total assets CSD. *Independent variables:* Residual managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors and is denoted as INSOWNRE. INSOWNQ is the squared value of managerial ownership. Institutional ownership variable is defined as percentage of ordinary shares held by institutional investors based on common equity shares under voting control and is denoted as INSTOWN. Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. *Control variables measures:* Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Residual natural logarithm of total assets labelled as LNSIZERE. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. Since board size and bank size are highly correlated at 0.433 (motivating this test), they are orthogonalised in regression models 1-3. In models (4-6), board size is redefined as number of board divided by natural log of total asset, BDLNSIZE (Anderson et al., (2004). The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

				Incremental impacts		
	CAP	NPLTL	CSD	CAP	NPLTL	CSD
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INSOWNRE	-0.166***	-0.009*	0.030***	-0.168***	-0.008*	0.034***
	(-2.947)	(-1.775)	(2.927)	(-3.044)	(-1.672)	(2.961)
INSOWNQ	0.0001	0.0005**		0.0001	0.0005**	
	(0.125)	(2.082)		(0.282)	(2.005)	
INSOWNQRE			-0.002***			0.0001
			(-3.092)			(0.189)
INSTOWN	0.047**	0.001	0.006	0.045**	0.002	0.007
	(2.160)	(0.349)	(0.497)	(2.064)	(0.614)	(0.630)
BDSIZE	-0.137***	-0.011	0.083**			
	(-3.174)	(-1.512)	(2.550)			
BDLNSIZE (ratio)				-2.891***	-0.416**	0.002
				(-3.144)	(-2.443)	(0.003)
FINBD	0.036**	-0.013***	0.019**	0.037**	-0.013***	0.017*
	(2.120)	(-3.008)	(1.974)	(2.160)	(-3.039)	(1.776)
ROA	2.668***	-0.088	-0.742**	2.549***	-0.043	-0.278
	(4.319)	(-1.050)	(-2.441)	(4.126)	(-0.504)	0.002
LNSIZERE	-0.106	0.090***	0.836***			
	(-0.691)	(3.154)	(4.379)			
Constant	8.563***	1.894***	4.445***	8.613***	1.991***	5.032***
	(4.809)	(4.994)	(4.838)	(4.790)	(5.044)	(5.560)
Year dummy	Included	Included	Included	Included	Included	Included
R-squared	0.125	0.134	0.076	0.124	0.127	0.025
Adj. R-squared	0.112	0.121	0.062	0.111	0.114	0.011
Wald test	7.14***	2.82***	4.38***	8.30***	2.96***	2.12**
II: F-test	4.18***	6.44***	3.72***	4.13***	5.98***	2.42**
#Obs.	800	796	805	800	796	805

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table 5-5 Risk measures of top quintile banks on board and ownership structure

Dependent variables: Capital adequacy is defined as book value of capital to total asset ratio, CAP. Asset quality refers to non-performing loans ratio defined as non-performing loans to total loans, and denoted as NPLTL. Liquid assets ratio is defined as cash and marketable securities to total assets, CSD. *Independent variables:* Residual managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors and is denoted as INSOWNRE. INSOWNQ is the squared value of managerial ownership. INSOWNQRE is the squared value of residual managerial ownership. Institutional ownership variable is defined as percentage of ordinary shares held by institutional investors based on common equity shares under voting control and is denoted as INSTOWN. Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. *Control variable measures:* Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. Given high multicollinearity between board size and bank size, I also take another approach and analyse only 146 large banks located in Q4-Q5 and sorted by Tobin's Q. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

	Q1-Q3 small banks			Q4-Q5 large banks		
	CAP	NPLTL	CSD	CAP	NPLTL	CSD
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INSOWNRE	-0.232**	0.004	0.003	-0.125**	-0.013**	0.063***
	(-2.247)	(0.401)	(0.217)	(-2.125)	(-2.461)	(3.380)
INSOWNQ	-0.001	0.0004		0.0004	0.001*	
	(-0.610)	(1.073)		(0.747)	(1.660)	
INSOWNQRE			-0.0004			-0.002
			(-0.395)			(-1.576)
INSTOWN	0.216***	-0.002	-0.006	-0.015	0.003	0.017
	(5.646)	(-0.440)	(-0.234)	(-1.055)	(0.953)	(1.304)
BDSIZE	-0.182**	-0.005	-0.089***	-0.056	-0.031**	0.077*
	(-2.470)	(-0.567)	(-2.632)	(-1.162)	(-2.270)	(1.749)
FINBD	0.070**	-0.007	-0.003	0.019	-0.016***	0.041***
	(2.121)	(-0.869)	(-0.209)	(0.942)	(-3.304)	(3.078)
ROA	1.411	0.004	-0.412*	4.124***	-0.179	-0.440
	(1.434)	(0.031)	(-1.796)	(8.663)	(-1.489)	(-0.913)
Constant	8.916***	1.403**	6.075***	9.738***	2.518***	2.656**
	(3.485)	(2.317)	(4.626)	(5.055)	(4.635)	(2.142)
Year dummies	Included	Included	Included	Included	Included	Included
R-squared	0.161	0.064	0.040	0.231	0.203	0.051
Adj. R-squared	0.136	0.036	0.011	0.210	0.181	0.026
Wald test	8.89***	0.53	2.11*	15.03***	4.34***	5.06***
II: F-statistics	0.12	2.09*	2.73**	5.44***	4.57***	0.71
#Obs.	381	377	381	419	419	424

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table 5-6 Board structure over pre- and post-Sabarnes periods and post Regulation A
Regression analysis of total loan losses ratio and z-Score on board governance over the two different periods: 2000-2002 and 2003-2005. *Dependent variables:* Total loan losses ratio is defined as total loan losses to total loans denoted as PLLTL. Return on assets plus capital asset ratio divided by variability of asset returns, and is labelled as z-Score. *Independent variables:* Residual board size is total number of board of directors on board denoted as BDSIZERE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Blockholders ownership is a percentage of shares held by institutions or individuals with greater than or equal to 5% ownership of the shares outstanding, and is labelled as BLOCK. CEO ownership is as the percentage of shareholdings by the CEO based on shares outstanding, denoted as CEOWN. Age of the CEO is denoted as AGE. *Control variables:* Natural logarithm of total assets labelled as LNSIZE. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

	2000-2002	2003-2005	2000-2002	2003-2005
VARIABLES		PLLTL		z-score
	Model 1	Model 2	Model 3	Model 4
BDSIZERE	-0.030***	-0.016**	-0.001**	-0.002***
	(-3.861)	(-2.317)	(-2.507)	(-3.281)
FINBD	0.002	-0.001	-0.0001	0.0002
	(1.276)	(-0.448)	(-0.926)	(1.436)
BLOCK	0.004**	0.003**	0.0002*	0.0001
	(2.070)	(2.043)	(1.725)	(0.781)
CEOWN	-0.003	-0.005*	0.0002	0.001**
	(-0.862)	(-1.946)	(0.859)	(2.029)
AGE	-0.002***	-0.002***	-0.000	-0.0001
	(-3.567)	(-3.423)	(-0.110)	(-0.362)
LNSIZE	0.117***	0.045**	0.005**	0.003***
	(5.926)	(2.491)	(2.426)	(2.728)
Constant	-1.019**	0.566	-0.077*	-0.056***
	(-2.383)	(1.338)	(-1.653)	(-2.794)
R-squared	0.12	0.04	0.044	0.017
Adj. R-squared	0.11	0.03	0.034	0.008
Wald test	6.51***	3.66***	3.86***	601***
#Obs.	591	635	578	609

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table 5-7 Simultaneous equations system (3SLS): Effect of board and ownership structure on the capital to assets and the non-performing loans

Managerial ownership variable is defined as percentage of ordinary shares held by top executive officers including the CEO and directors and is denoted as INSOWN. Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Capital to assets ratio is defined as book value of capital to total asset ratio, CAP. Asset quality refers to non-performing loans ratio defined as non-performing loans to total loans, and denoted as NPLTL. *Instrumental variables:* Tenure captures number of years served by current CEO, labelled as TENURE. The age of the firm since its establishment is labelled as AGE. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns, and total debt to total assets ratio. Residual of natural logarithm of total assets labelled as LNSIZE. NYSE is a dummy variable that takes the value of 1 if the firm is listed on the new York Sock exchange, otherwise 0.

	Three stage least square (3SLS)								Ordinary Least square	
VARIABLES	CAP	INSOWN	BDSIZE	FINBD	NPLTL	INSOWN	BDSIZE	FINBD	CAP	NPLTL
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
INSOWN	-0.110**		0.048	0.410***	0.038***		0.076	0.098	-0.018	0.007***
	(-2.136)		(1.350)	(3.858)	(7.010)		(1.166)	(0.792)	(-1.549)	(3.320)
BDSIZE	-0.988***	-5.266***		3.758***	0.093	-5.644***		5.992***	-0.081**	-0.004
	(-2.598)	(-5.773)		(9.558)	(1.382)	(-2.646)		(26.684)	(-2.245)	(-0.675)
FINBD	0.383***	1.548***	0.221***		-0.013	0.836**	0.158***		0.018	-0.006***
	(5.273)	(10.684)	(16.376)		(-1.124)	(2.431)	(12.557)		(1.573)	(-3.423)
CAP		-2.993***	-0.365***	0.969***						
		(-11.158)	(-6.176)	(2.890)						
NPLTL						26.390***	-1.196*	-1.009		
						(4.382)	(-1.694)	(-0.342)		
TENURE		0.132***				-0.042				
		(3.627)				(-0.578)				
AGE			0.010***				0.003			
			(4.031)				(0.792)			
ROA				5.093***				0.839		
				(4.216)				(1.106)		
σ_i		46.076***				5.931				
		(5.606)				(0.293)				
LNSIZERE	0.128	-1.865***	0.252***		0.125***	-3.157***	0.251		0.366***	0.038**
	(0.697)	(-5.221)	(2.720)		(4.469)	(-4.458)	(1.443)		(3.486)	(2.137)
TAGR				0.051***				-0.017		
				(5.737)				(-0.697)		
NYSE	0.886				0.036				2.589*	0.290
	(0.413)				(0.376)				(1.666)	(1.185)
Constant									13.522***	0.922***
									(7.506)	(3.209)
R-squared	0.752	-2.230	0.839	0.923	0.240	-2.613	0.870	0.876	0.018	0.019
#Obs.	1,226	1,226	1,226	1,226	1,222	1,222	1,222	1,222	1,717	1,732

t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 5-8 Robustness test

Panel A shows the results of the Glejser's (1969) heteroskedasticity tests for banks risks**.** *Dependent variables:* Absolute value ROA_abs residuals, return on equity is defined as return on net income divided by equity, and denoted as ROA. Absolute value RLLA_abs residuals, RLLA are the reserve loan losses ratio is defined as reserves loan loss to total loans. *Independent variables:* Residuals of Managerial ownership variable are defined as percentage of ordinary shares held by top executive officers including the CEO and directors and is denoted as INSOWNRE. INSOWNQ is the squared value of managerial ownership. Institutional ownership variable is defined as percentage of ordinary shares held by institutional investors based on common equity shares under voting control and is denoted as INSTOWN. Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. *Control variable measures:* Book value of capital to total asset ratio, CAP. Natural logarithm of total assets labelled as LNSIZE. *Panel B: Dependent variables:* Capital adequacy is defined as book value of capital to total asset ratio, CAP. Asset quality refers to non-performing loans ratio defined as non-performing loans to total loans, and denoted as NPLTL. Additional control variables: Return on equity denoted as ROA. Return on equity denoted as ROE. Total debt to total assets ratio, measures of financial leverage, denoted as LEV. LNSIZEDU takes 1 if LNSIZE is greater than the median for all firms, otherwise 0 LNSIZEDU takes 1 if LNSIZE is greater than the median for all firms, otherwise 0. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wad test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

	Panel A: Glejser's (1969) heteroskedasticity test		*Panel B:* Additional control variables		
	Absolute value ROA_abs residual	Absolute value RLLA_abs residual	CAP	NPLTL	CSD
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5
INSOWNRE	0.010**	0.000***	-0.176***	0.004	0.032***
	(2.073)	(4.062)	(-3.135)	(0.558)	(2.949)
INSOWNQ	0.000	0.000	-0.00001	0.0004**	
	(0.771)	(0.319)	(-0.023)	(2.064)	
INSTOWN	0.000	0.000	0.047**	-0.001	0.012
	(0.000)	(1.312)	(2.217)	(-0.213)	(1.018)
BDSIZE	-0.007*	-0.000***	-0.104**	-0.024***	0.043
	(-1.665)	(-4.388)	(-2.513)	(-2.744)	(1.419)
FINBD	0.001	0.000	0.029*	-0.012***	0.019*
	(0.681)	(0.425)	(1.648)	(-2.976)	(1.948)
CAP	0.010***	0.000***			
	(2.624)	(3.421)			
LNSIZE	0.006	0.000**			
	(0.318)	(2.119)			
LNSIZEDU			-1.043**	0.088	0.374
			(-1.966)	(0.811)	(1.117)
ROA			2.762***		-0.087
			(4.376)		(-0.292)
ROE				-0.024**	
				(-2.132)	
LEV				-0.032***	0.052**
				(-3.217)	(2.464)
Constant	0.143	-0.003	9.235***	4.621***	-0.224
	(0.362)	(-1.055)	(5.116)	(4.124)	(-0.114)
R-squared	0.037	0.114	0.129	0.179	0.036
Adj. R-squared	0.023	0.101	0.116	0.166	0.021
Wad test	5.73***	1.94*	7.19***	2.76**	4.15***
MVIF	1.39	1.40	1.38	1.37	1.41
#Obs.	800	816	800	807	800

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.10

Chapter 6: Managerial Incentives and Risk-Taking in Banking

6.1 Introduction

This empirical chapter builds on the preceding two empirical chapters. It looks at one dimension of investigation – executive compensation and bank governance. It enquires whether managerial incentive compensation via board structure is important in bank risk-taking – an area which is not widely researched. The main objective of this chapter is to advance the understanding of the impact of managerial incentive compensation on risk in banking institutions. Executive compensation and board structure have been cited in corporate scandals, for their role in excessive risk-taking and the global financial crisis (Chen et al., 2006; Adams, 2009; Pathan, 2009; Walker, 2009). Today, managerial compensation and incentives in the financial sector have sparked strong opinions among the public, policymakers, congressional/parliament leaders, politicians, and taxpayers over promoting excessive risk-taking in banks[53]. Accordingly, motivated by scaling down bankers' excessive pay policy, investigation in this area is both timely and significant.

This investigation finds a strong link between bank risk and equity-based compensation. First, equity return volatility is positive and statistically significant in relation to stock ownership and stock options. Total debt to total assets ratio (leverage) increases in stock option and not in stock ownership. The insight of these results is that managerial incentive compensation tends to lead to higher bank risk and financial leverage. Accordingly, the logic may be that equity-based packages encourage risk-taking (Chen et al., 2006) and aggressive debt policies in banking institutions.

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[53] For example such public outcries include those surrounding the jet ordered by Citigroup in 2005, dining and wining at Wynn Las Vegas hotel by Wells Fargo staff following staff mortgage sales, and bonus payouts of billions of dollars, and $440,000 spent by AIG on a lavish corporate retreat just a week subsequent to accepting an $85bn emergency loan from the US government to avoid bankruptcy.
http://www.telegraph.co.uk/finance/newsbysector/banksandfinance/4511948/Bankers-excesses-what-caused-the-public-outcry.html.

In addition, this evidence confirms the risk-aversion hypothesis (Smith and Stulz, 1985). That means managers may take on excessive risks once they are proportionately rewarded to represent the shareholders' preferences for increased risk maximisation of firm value, consistent with agency theories. For comparability, in the competing view of moral hazard context, one can argue that if banks possess higher charter value, they are self-disciplined in engaging in risky investment choices (Keeley, 1990). Indeed, these two competing theories would produce opposing results. Second, with cash-based compensation, the parameter impacts positively and negatively in equity return volatility and leverage, respectively. The positive coefficient estimate is consistent with those indicated by Harjoto and Mullineau (2003) in the opposite direction. And it may be supportive of the view (and outcry) that bankers' excessive pay packages - 'bonuses' - are presumed to have driven the recent global financial crisis in a more deregulated financial sector environment. The result is the US proposed capping of executive compensation at $500,000 (salary and bonus) for firms under the Troubled Asset Relief Program[54].

Third, across all regression models, it is found that the coefficient estimate of market to book ratio is negative. This pattern clarifies the idea that though principal-agent models dominate the results, the moral hazard models are important in this empirical investigation. Fourth, board size is negative and statistically significantly related to bank risk and risky debt in all model specifications. Consistent with the neutral shareholder preferences, this evidence explains that managers of larger bank boards are very well compensated. In effect, they have more incentive to select riskier investment portfolios as well as implementing an aggressive debt policy. Finally, along with the bank policy implication, equity-based compensation, board structure, risk and leverage are endogenously determined.

The classical agency theory predicts that managerial incentive compensation aligns the CEO with shareholders' long term preferences of maximising the value of the firm. On theoretical fronts, Smith and Stulz (1985) and Jensen and Meckling (1976) have documented that equity-based compensation affects risk-taking behaviour to risk-averse managers and is important in reducing agency conflicts. As such, it provides managerial incentives to risk-taking - i.e. to pursue high-risk high-return investments. While research on managerial compensation and risk-

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54 See http://www.nydailynews.com/news/politics/2009/02/04/2009-02-04_president_obama_caps executive %20compensat.html.

taking in depository institutions has documented conflicting results, there have been a few studies that examine this relationship. Summarised in Table 2-3, they show there is some link between risk and managerial incentive compensation.

This empirical chapter makes four main contributions to the bank compensation literature. First, it analyses the association between executive compensation through board structure and bank risk and risky debt. Limited opposing evidence has been documented on the effect of managerial compensation incentives on bank risk-taking. (Houston and James, 1995; Angbazo and Narayanan, 1997; Brewer et al., 2003; Harjoto and Mullineaux, 2003; Chen et al. 2006). However, most research examines the impact of different sources on bank risk-taking through ownership structure (see Table 2-1). As such, consistent with evaluation, risk-taking and debt policy measures are linked to managerial incentive compensation. Given the different impact of managerial incentive compensation, Narayanan (1996) proposed that they should be disentangled.

Second, it adds to the banking literature by examining corporate governance mechanisms along with bank risk in two areas, namely, managerial alignment and monitoring. Theoretically, managerial incentive compensation and corporate boards are substitutes that affect firm value through risk level, and they are important in mitigating agency conflicts between managers and owners. Third, it combines diversity of theories – agency, moral hazard, and deregulatory environment and their influence on managerial incentive compensation and bank risk. Though the main theory tested is principal-agent, given the fact that banks are unique (Morgan, 2002), other highlighted theories are tested. Much existing evidence uses agency theory to examine the tension between managerial compensation and bank risk.

With regard to moral hazard hypothesis, banks are assumed to enjoy the government protections and other bail outs. Houston and James (1995) reveal that their results are largely explained by the moral hazard hypothesis. They show that compensation does not promote bank risk-taking. While, Chen et al. (2006) show that stock options contribute to bank risk-taking, yet, they argue that the positive direction was driven by the information asymmetry hypothesis and not principal-agent theory. Finally, under a deregulatory banking regime, though not necessarily, banks may be expected to pursue risky strategies. To sum up, this investigation has policy implications for the level and structure of managerial compensation and risk-taking in banking. Thus, it recommends that bank compensation contracts

should embed the concepts not only of maximising firm value, but also ought to consider the risk-taking factor.

The next section discusses the theoretical considerations. Section 6.3 develops hypotheses. Section 6.4 describes data used and methodology. Section 6.5 discusses empirical results. Section 6.6 ends with a conclusion.

6.2 Theoretical Motivation

In a survey of the executive compensation literature, Murphy (1999) concludes that the issue of executive pay appears to have its roots in agency-theoretical models. Agency theory advances the notion that because managers with undiversified wealth portfolios are risk-averse, equity-based rewards induce them to take on increasingly risky and value-enhancing projects (Jensen and Meckling, 1976; Smith and Stulz, 1985). This in turn increases the CEO's wealth portfolio sensitivity to stock price through aligning managerial incentives with those of well-diversified shareholders. It is hypothesized, therefore, that in managerial risk aversion models, risk-neutral shareholders will employ managerial incentive compensation to closely tie managers' interests to those of their own to maximise value of the firm. These stimuli may motivate managers to engage in positive net present value and risky investment projects by increasing stock return volatility. Accordingly, firm risk will vary directly with stock ownership and stock options compensations – i.e. risk rewarding equity-based.

The second agency competing view is around derived firms' private benefits protection by risk-averse managers. Under this scenario, the principal agent models predict a negative relationship between equity-based compensation and firm risk. Garen, (1994) reports that delta decreases in the interaction of firm size and residual standard deviation. Aggarwal and Samwick (1999) show that pay-performance sensitivity (delta) declines in stock return volatility. Theoretically, the value of equity is sensitive to both stock price and stock return volatility – this sensitivity is referred to as delta (slope) and vega (convexity), respectively. While incentives derived from delta encourage managers to pursue positive net present value projects, stimuli generated from vega may encourage managers to undertake risky projects (Jensen and Meckling, 1976; Smith and Stulz, 1985; Guay, 1999). The theoretical literature has also shown that the delta of the CEO is predicted by the capital structure, firm size and firm risk (John and John, 1993). And, the pay-

performance sensitivity of the CEO is a monotonically decreasing function of debt, firm size, and firm risk.

In theory, cash contracts outweigh managerial incentives to pursue risk-taking behaviour. In a theoretical model by Smith and Stulz (1985), managerial payoffs embedded in bonus payments are not rewarding – i.e. non convex. For industrials, Berger et al. (1997) and Coles et al. (2006) empirically show that excess compensation/salary and bonuses lead to managerial entrenchment behaviour by managers hesitating to pursue aggressive debt policy. Based on these theoretical and empirical supports, it may be logical that risk-averse entrenched managers will undertake passive debt policies and decline risky positive net present value projects. Indeed, these incentives are in line with managers conserving their undiversified accumulated human capital. In opposing theory, Noe et al. (1996) advocate that bonus incentive pay can drive risk-shifting in financially distressed banks in a deregulatory environment.

Four complementary theories, namely contracting, moral hazard, information asymmetry, and deregulatory environment also have relevance to managerial compensation incentives and bank risk-taking tension. In fact, they motivate the analysis of this empirical chapter due to the mixed theorems under principal-agent model. The contracting hypothesis predicts higher levels of executive compensation for firms with more growth options and investment opportunity sets (Smith and Watts, 1992). Firms with better financial prospects tend to more closely tie managers' wealth portfolios to firm performance and thus towards greater risk-taking incentives. The moral hazard hypothesis postulates that compensation policies in banking (in particular, equity-based ones) are intended to motivate risk-taking so as to maximise the put-option feature of fixed-rate deposit insurance (Merton, 1977; Saunders et al., 1990). Yet, higher managerial incentives to risk-taking can be constrained by bank's higher charter value (Keeley, 1990).

The information asymmetry hypothesis predicts a positive association between bank risk and compensation. The deregulation hypothesis posits that a firm's capability in adjusting to a vibrant environment is important to its continued existence (Kole and Lehn, 1999; Prendergast, 2002). This hypothesis predicts that pay-performance sensitivity becomes higher as bank management becomes less regulated. Taken together, theories tested in this investigation are anchored in the premise that managerial compensation contracts are designed to maximise the wealth of shareholders.

6.3 Hypotheses Development

6.3.1 Testable Hypotheses

Based on the above theoretical discussions, this section produces testable hypotheses. The academic debate suggests that in agency relationships when managers are compensated accordingly they will hesitate to pursue their own self-serving behaviour. Instead, they will engage in corporate strategies - i.e. investment, financing, and aggressive debt policies that enhance the shareholders' long term goals to firm value-maximisation. Specifically, equity-based compensation in the form of stock and stock options is more preferred to cash and bonus-based compensation to invoke managerial risk-taking behaviour. In effect, this structure of executive compensation can help to mitigate agency conflicts and induces managers to represent shareholders' attitude to risk-taking behaviour.

6.3.2 Equity-based compensation and bank risk

In theory, the combination effect of equity-based compensation and other governance mechanisms is important in controlling agency risk-related incentive problems. Subsequently, this interdependence could reduce agency monitoring costs and agents' risk-aversion opportunistic behaviour (Jensen and Meckling, 1976; Smith and Stulz, 1985).

In the banking literature, there is evidence that risk and managerial risk-taking sensitivity (through equity-based compensation) are connected, see Table 2-3. This related work documents that managerial ownership and market risk measures are statistically positively associated. Consistent with risk-taking hypothesis, Laeven and Levine (2009) indicate that cash flows rights and bank z-score are strongly negatively related. The insight from this association is that greater cash flow rights motivate higher bank default risk. Angbazo and Narayanan (1997), Brewer et al. (2003) and Harjoto and Mullineaux (2003) report that CEO equity based compensation (stock and options grants) is positively related to stock return volatility (bank risk). This body of research implies that equity based compensation encourages risk-taking and implementation of aggressive debt policies in banks. Consistent with the risk-aversion hypothesis, Chen et al. (1998) indicate that risk and ownership structure are negatively associated, and Houston and James (1995)

show that equity-based incentives do not lead to increased risks, contrary to the risk-taking hypothesis (see Smith and Watts, 1992).

Chen et al. (2006), Mehran and Rosenberg (2008), and Vallascas and Hagendorff (2010) indicated that option-based wealth induces risk-taking in banks. While the former study shows that market risk measures are positively related to option-based executive compensation, the latter highlights that distance to default and CEO stock options are negatively connected. The message derived from this research is that the recent widespread usage of stock options in financial firms – i.e. greater stock return volatility - leads to higher stock option value (Smith and Stulz, 1985).

Consequently, the above arguments propose that increases in equity incentives can help to align managerial risk-taking behaviour with shareholders' interests of increasing firm value. As such, bank managers will undertake riskier and positive net present value investments that maximise the interests of shareholders (Jensen and Meckling, 1976; Smith and Stulz, 1985). Moreover, an increasingly deregulated banking environment in the 2000s could have intensified bank managerial risk-taking incentives leading to expanded investment opportunity sets similar to industrial firms (Chen et al., 2006). Hence, if potential managerial risk-aversion behaviour is mitigated, managers will take actions which are beneficial to shareholders' wealth, then, bank risk will increase in stock ownership and stock options. A similar prediction will be true for the total equity compensation (i.e. summation of stock ownership and stock option value). Accordingly, this discussion leads to the first hypothesis linked to managerial incentive compensation and risk divided into three parts:

H1a: Bank risk is positively associated with CEO's stock ownership-based compensation.

H1b: Bank risk is positively associated with CEO's stock option-based compensation.

H1c: Bank risk is positively associated with total equity-based compensation.

With debt policy, banks have lower pay-performance sensitivities (i.e. highly leveraged with significant debt ratio), thus, their managers' incentives to increase

debt risk through risk shifting tend to decrease. With this theoretical perspective, debt risk is expected to decline in bank compensation (John and John, 1993). However, if owners are to increase bank risk through maximising the put-option feature of deposit insurance (Merton, 1977; Saunders et al., 1990) and if equity-based compensation provides effective risk incentives then an increase in debt ratio will be detected.

Angbazo and Narayanan (1997) and Harjoto and Mullineaux (2003) indicate that compensation (stock and options grants) and leverage are positively connected. John and Qian (2003) report a negative relationship between delta and debt ratio. Brewer et al. (2003) show no association between these parameters. This evidence, therefore, is contradictory. Capital regulations acting as substitutes for other disciplining mechanisms are intended to shape excessive risk-taking and the possibility of bank insolvency. Then, a decrease in risky debt is predicted. Accordingly, these arguments lead to the second hypothesis connected to managerial incentive compensation and risky debt:

H2: Bank leverage is negatively associated with total equity-based compensation.

6.3.3 Short-term compensation (cash contracts) and bank risk

According to John and John (1993) and Narayanan (1996), the disentangling of managerial incentive compensation is important. Both equity and cash-based compensation have different impacts on managerial corporate decisions – i.e. managerial incentives to risk-shifting incentives. Theoretically, managers compensated in cash contracts (i.e., concave function of firm value) are likely to decline variance-increasing positive net present value investments as they offer concave payoff (Smith and Stulz, 1985). Indeed, if manager's expected utility is a concave function of firm value, managers will exhibit similar risk-aversion behaviour to overcome bankruptcy (John and John, 1993). In other words, cash contracts are utilised to reduce the likelihood of agency problems between debt holders and owners. More important they mitigate the risk-shifting to the latter from the former. However, the impact of this on risk-taking may be in the opposite direction given the prevailing regulatory environment (Noe et al., 1996) - i.e. distressed banks.

Three researches have reported a link between cash contracts and bank risk. While Harjoto and Mullineaux (2003) find that CEO salary increased in risk (measured by stock return volatility), Vallascas and Hagendorff (2010) indicate that distance to default (default risk) declined in CEO bonuses (i.e. positively). Benston and Evan (2006) indicate a negative relationship between bonus and market to book value ratio. Empirical evidence in this area of research is frankly contradictory.

Such arguments opine that cash-based compensation can motivate managerial perverse behaviours (i.e. risk aversion hypothesis) that are detrimental to shareholders (Berger et al., 1997). As such, cash contracted managers are better diversified and will tend to make conservative investment decisions through undertaking safe riskless projects. Consistent with these competing arguments, if cash contracts dis-incentivise risk-taking behaviour, greater cash-based compensation will result in decreasing managerial incentives to take more risk. This leads to the final hypothesis related to cash contract and risk-aversion hypothesis divided into two parts.

H3a: Bank risk is negatively associated with managerial cash-based compensation.

H3b: Bank leverage is negatively associated with managerial cash-based compensation.

6.4 Data and Methodology

6.4.1 Data and sample selection

The data and sample selection are discussed in Chapter 4. The definitions of dependent, explanatory and control variables are reported in Appendix III.

6.4.2 Methodology

The objective of this investigation is to examine the association between managerial incentives and risk-taking, and the interactive effect of board structure governance. Managerial incentives explicitly include the various contractual compensation schemes of CEOs, listed below.

A. Risk measures

The primary dependent variables are two - i.e. annualised equity return volatility and leverage. These variables have been previously used to proxy risk (Coles et al., 2006; Chen et al., 2006; Laeven and Levine, 2009). The standard deviation of stock returns captures the total risk of the firm (all-in-risk) related to assets, liabilities, and off-balance sheet risk exposures (Demsetz et al., 1997). They indicated a positive and significant association between insider holdings and all-in-risk. Debt ratio (leverage) measures risk-shifting incentives of shareholders' to debtholders (Jensen and Meckling, 1976).

B. Empirical specification

Following Chen et al. (2006), Coles et al. (2006), and Laeven and Levine (2009), the link between managerial incentives and their impact on bank risk-taking are explored via board governance. More importantly, the boards formulate policies associated with executive compensation and are the determinants of risk. According to John et al. (2000), the managerial compensation structure in place affects the investment choices. To formally analyse this association, the following generalised regression equation (6.1) is estimated.

$$\text{Risk} = \alpha + \beta_1(\text{managerial incentives}) + \beta_2(\text{board structure}) + \beta_3(\text{control variables}) + \beta_4(\text{Time.Dummy variables}) + \varepsilon \quad \text{.....(6.1).}$$

where Risk is represented by standard deviation of stock returns and financial leverage. The primary interest focuses on the coefficient estimates of managerial incentives (β_1). These compensations include natural log of stock ownership denoted as CEO-STOCK, natural log of Black and Scholes value of stock options, labelled as CEO-OPT, natural log of equity-based compensation, labelled as CEOEB, and natural log of cash and bonus, denoted as CEO-CB, and natural log of total compensation, denoted as TC. This includes the summation of the natural log of cash-based and equity-based compensation. Cash compensation is defined as the natural log of the summation of bonus and salary compensation to CEO. The natural log of stock ownership compensation value is calculated by multiplying

the number of shares granted to the CEO by closing price as at 31 December each year.

The valuation of the CEO stock option is based on the equation (3.1) pp. 67, presented in sub-section 3.3.2.1, Chapter 3. Equity-based compensation is equal to the natural of the summation of the value of stock ownership and stock option. In theory, risk is a positive function of equity-based compensation (Jensen and Meckling, 1976; Smith and Stulz, 1985). Hence, positive coefficient estimates of stock ownership, stock option, and total equity-based compensation is expected (Chen et al., 2006; Vallascas and Hagendorff, 2010). Negative coefficient estimate of cash bonus compensation implies managerial entrenchment.

Negative and positive estimates of board size and the proportion of independent directors (i.e., board structure, β_2), respectively, are supportive of the popular view of smaller boards and larger independent board composition. Moreover, this investigation checks for the effects of tenure, market to book ratio, and bank size on bank risk. CEO tenure compensation captures the risk aversion of the entrenched CEO (Berger et a., 1997). This variable is predicted to be negative. Market to book ratio, MTB, serves as a proxy for differences in bank expanded investment opportunity sets. Growth firms will select a riskier investment portfolio (Smith and Watts, 1992; Guay, 1999), and thus, a positive estimate on MTB. Alternatively, negative on market to book ratio captures bank charter value (Keeley, 1990). This is a self-imposed disciplinary device that moves banking institutions to undertake risky strategies. Finally, a positive sign on MTB can suggest presence of information asymmetry problems - firms with greater information asymmetry largely compensate managers with long-term incentives. Having these positions, a positive or negative sign is expected.

Bank size is proxied by the natural log of total assets. Negative estimates of LNSIZE reflect the fact that large banks easily diversify their risk assets portfolio (i.e., financial services and business operation), which in turn, reduces bank risk-taking behaviour (Flannery and Sorescu, 1996). Moreover, a positive sign on LNSIZE would be predicted if shareholders of large banks had incentives to pursue risky strategies, since in theory they are less vulnerable to higher information asymmetry. Thus, managers of these firms should be highly compensated. For instance, Guay (2009), Chen et al. (2006), and Low (2009) indicate a positive association between firm size and managerial risk-taking incentives. So, one can note, that the effect of firm size depends on the risk proxy employed (Demsetz and

Strahan, 1997). Time effects which control for inter-temporal variations in market conditions, tax effects and bank sector differences are captured by the time dummy variable.

6.4.3 Endogeneity and joint determination of CEO pay, board structure and risk

From the theoretical arguments and empirical evidence examined, managerial incentives and corporate value are jointly determined in a simultaneous equations framework (Demsetz and Lehn, 1985; Hermalin and Weisbach, 1998). This is intended to account for the possible endogeneity problem, and enhance estimation efficiency in coefficients. Following this idea, therefore, it is not surprising to hypothesise a reversed causality among bank risk, managerial incentives, and board characteristics. These variables are treated endogenously, in the same way as other studies do (Sierra et al., 2006; Chen, 2006). Next, this empirical analysis conducts further diagnostic check that deals and remedies the endogeneity issue. A system of four (4) simultaneous equation models is formulated by using the 3SLS method. Equity return volatility/leverage, equity-based pay to CEO, board size, and proportion of independent directors are defined as endogenously determined to each other, as specified in equations (6.2) to (6.5).

The system of equations comprises four endogenous and eight exogenous variables. In every system, managerial incentive compensation, a strong board, and risk are dependent on each other. To ensure that order condition for identification is satisfied, each equation excludes at minimum three of the exogenous variables. To estimate the 3SLS system, the following set of instrumental variables is employed: TENURE, SPLIT, AGE, MTB, ROA, CART, LNSIDEDU, and LNSIZE. Then, the presence of endogeneity is tested through regressing each endogenous variable on all exogenous variables. Residual values of every endogenous variable are obtained and then added to the original equations and OLS is estimated. A significant coefficient estimate on predicted value confirms the presence of endogeneity. By performing the Durbin-Wu-Hausman (DWH) test, overall, the null hypothesis of no endoegeneity cannot be rejected at 1%.

Therefore, the first specification is related to risk. Consistent with extant literature and managerial risk-taking incentive theories, equity-based compensation is modelled on risk (Chen et al., 2006; Vallascas and Hagendorff, 2010). These

authors show that stock option and equity-based rewards provide managers with incentives to undertake risky projects. Based on these arguments, CEO pay is expected to be positive. As in Sierra et al., (2006) and Pathan (2009), board characteristics are also added to the system. Controlling for these parameters, Pathan (2009) indicates that risk is negatively related to board size and the proportion of independent directors. However, if a board of directors are representing shareholders' long term preferences, board size and proportion of independent directors are expected to be negatively and positively related to risk, respectively. Consistent with conventional theory, Sierra et al. (2006) report a strong positive association between a strong board and bank performance. Thus,

Risk =f[ln(CEO pay), board size, proportion of independent directors, tenure, market to book, ln(firm size)].....(6.2).

Equation two is on executive pay. In linear specifications, Harjoto and Mullineaux (2003) show CEO cash compensation and bank risk (measured by stock return volatility) are positively related. John and Qian (2003) show that delta is negatively related to bank risk (square of market value of equity multiplied by stock return volatility and leverage ratio). Theory suggests that managerial pay-performance sensitivity declines in leverage (John and John, 1993). And Chen et al. (2006) document that CEO option compensation is positively associated with risk. For comparability, in a three-equation system, Sierra et al. (2006) report that CEO pay is positively related to standard deviation on return on assets, consistent with the theoretical prediction. Taken together, it is hard to predict the direction of bank risk. Sierra et al. (2006) also report a negative association between board index and CEO pay. If the substitution hypothesis prevails, board size and the proportional of independent directors are expected to be negative. Then,

Ln (CEO pay) =f[Risk, board size, proportion of independent directors, tenure, market to book ratio, ln(firm size)].....(6.3).

Equations three and four relate to board structure. The popular view supports the idea of smaller boards and higher proportions of independent directors which are seen as better in mitigating agency conflicts (Yermack, 1996). The negative

(positive) association between these attributes suggests their substitution (complementary) effects in monitoring harmful managerial actions. Pathan (2009) reports that board size and the proportion of independent directors are negatively related to risk, suggesting that the greater use of either variable affects bank risk-taking (for corporate firms, see Beiner et al., 2006). The negative pattern holds true for the executive pay/managerial ownership coefficient estimate in boards (Booth et al., 2002; Sierra et al., 2006). This relationship implies that strong a board motivate managers to lower their compensations. Accordingly,

Board size =f[proportion of independent directors, CEO pay, risk, age, ln(market to book ratio), CAP, ln(firm size)].....(6.4).

Proportion of independent directors =f[Board size, risk, proportion of independent directors, CEO pay, split, ln(market to book ratio), ln(firm size)].....(6.5).

6.4.4 Summary statistics

Table 6-1 presents the key descriptive statistics of this empirical analysis. Managerial compensation is reported in several different ways. It ranges from salary, bonuses, stock options, and restricted stocks of CEOs and top executive officers. This empirical analysis focuses on CEO equity-based and cash-based compensation, and asks whether managerial compensation schedules influenced risk-taking behaviour in the US banking sector. To lessen the extent of extreme values, variables are winsorised at the 1% and 99% levels, and natural logarithmic transformation is used where necessary. The winsorised variables are market to book ratio, return on asset, return on equity, stock ownership value, stock options value, equity-based and cash-based compensation, and total compensation.

The CEOs are paid an average of $0.82 million (natural log $13.04 mil) in salary and bonus annually, representing about 2.55% of CEO total compensation. Besides this, they receive $32.00 million (natural log $15.95 mil) in total equity-related compensations. The mean value of CEO equity-based compensation exceeds cash-related compensation by 97.45%. The proportion of options via total compensation on average is about 29%. This growth entails a dramatic increase in equity-based compensation relative to cash-related compensation in the US banking industry over the years 200-2005. On average, the board of directors

contains 12 members, with a maximum of 33 members, and these seats are largely filled by independent directors (76% of board members). Arguably, this board composition can influence both the level and the structure of compensation, which increases firm value and is likely to monitor executive behaviours. The remaining 24% of its members are presumed to be less detrimental to board independence.

Table 6-2 shows pair correlations between explanatory variables at the 5% level of significance. The results show that not all correlations are on the high side. However, the largest correlations are between: CEO stock ownership and firm size (0.447), cash compensation and board size and firm size (0.320, 0.681), respectively, and board size and firm size (0.431)[55]. The remainder of interested correlations are below 0.30 in magnitude. As in the proceeding empirical analyses, multicollinearity techniques are employed to rectify the problem – i.e. variance inflation factors in every regression model is performed, the highly correlated are orthogonalised and some variables are replaced.

6.5 Empirical Results

A *t*-test of the null hypothesis that a coefficient is equal to zero is carried out for estimated parameters. The *t*-value and standard error are computed by clustering observations within each bank so as to remove heteroskedasticity and serial correlation by White's (1980) method. Year dummies are included in each regression model to measure the inter-temporal variations on market conditions and banking sector developments.

6.5.1 CEO-based managerial incentive compensation

The findings of testing the relationship between the bank risk and CEO equity-based compensation are presented in Table 6-3(a). The first equity-based pay is CEO stock ownership, CEO-STOCK. Since CEO stock ownership and bank size variables are positively correlated. They are orthogonalised and residual CEO stock ownership incentives used as explanatory variables. In models (1)-(4), there is a positive association between CEO stock ownership and equity-return volatility at

[55] Pathan (2009) reports 0.38 as the correlation coefficient between board size and bank size at 1% level of significant. He argued that the joint inclusion of them in a single model specification would not invalidate the results as their average variance inflation factor is 1.65.

better than the 1% level of significance. Positive coefficient estimates on CEO stock ownership suggests that equity-based compensation increases the likelihood of bank risk-taking. This result confirms the stock ownership findings by Saunders et al., (1990), Angbazo and Narayanan (1997), Demsetz et al., (1997), Anderson and Fraser (2000), Lee (2002), Brewer et al. (2003), Harjoto, Mullineaux (2003, and Laeven and Levine (2009), and others[56].

Nonetheless, this evidence is inconsistent with the results by Houston and James (1995) and Chen et al., (1998). It may be logical that stock ownership compensation provides incentives which encourage risk-averse managers to accept risky and positive net present value projects (Jensen and Meckling, 1976; Smith and Stulz, 1985). This can be explained by the idea that equity-based compensations are more likely to increase those managerial incentives to risk-taking that lead to maximisation of both bank share price value and firm value.

Critically, CEO-STOCK continues to enter equity-return volatility positively and significantly (at 1% level) when board characteristics, such as board size and the proportional of independent directors, and tenure are included in model specifications (2)-(3). To correct for the high correlation between board size and firm size (at 0.431), these variables are orthogonalised in mode (4). This alternative specification uses the residual board size, BDSIZERE. The residual board size value is defined in the ordinary least square of board size on bank size. Again, this parameter is negative. The results from the orthogonalisation confirm the findings in models (1)-(3). Accordingly, the statistically significant positive coefficient estimates on CEO stock ownership offer support for hypothesis H1a. They are also supportive of the risk aversion hypothesis.

In models (5)-(8), a second equity-based incentive, CEO stock options, CEO-OPT is presented. CEO-OPT and equity-return volatility are positively related at better than the 1% level of significance. The evidence confirms the expectation. The result is consistent with the few examples of extant empirical evidence (Harjoto and Mullineaux, 2003; Chen et al., 2006; Mehran and Rosenberg, 2008; Vallascas and Hagendorff, 2010). It is inconsistent with findings by Houston and James

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[56] However, this research work does not separate stock ownership and stock options held by executives. The separation of wealth by executive is important as each pay contract has a different impact on corporate strategies (John and John, 1993; Narayanan, 1996).

(1995) and Angbazo and Narayanan (1997)[57]. The evidence presented is supportive of the theoretical view by Smith and Stulz (1985). That option-based compensation provides greater convex payoffs, which in turn, reduces managerial risk-aversion behaviours. By possessing these incentives, executives may undertake risky but rewarding investments that increase the value of the bank and their wealth.

In contrast to CEO stock ownership, coefficient estimates of CEO stock options can also be construed as long term motivators of managerial incentives to greater risk-taking for shareholders' preferences. Moreover, the evidence remains robust once the board and firm characteristics and individual year variables are included. The interpretation is qualitatively similar to that provided for CEO stock ownership. Compared to a study by Angbazo and Narayanan (1997), stock option-based usage in banks has become more prevalent (Chen et al., 2006; Deyoung et al., 2010). Given this environment, the high powered option-based compensation culture has escalated risk-taking in banking firms. Subsequently, H1b that bank risk varies directly to CEO stock options cannot be rejected.

Controls for board characteristics - both board size and CEO tenure - enter negatively and significantly at the 1% level in all regression models, as expected. The positive estimate on board size is consistent with that reported by Staikouras et al., (2007). The negative signs may suggest three emerging issues with regard to boards. First, smaller boards formulate extreme policies in designing bank executive compensation packages that enhances bank risk. And these impact bank compensation contract design for executives. In effect, the said compensation packages drive managerial incentives to greater levels of risk-taking. In this case, it could be argued that compensation policies in place mediate bank risk-taking at present compared to the past – see Houston and James (1995). Second, both managerial compensation and smaller board (i.e., strong board) are not only motivating bank risk-taking, but also, they may be a substitute in disciplining executive behaviour.

Third, coefficient estimate on tenure is in line with accepted corporate governance theories. It supports the arguments that risk-averse entrenched CEOs

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[57] Study by Vallascas and Hagendorff (2010) utilises distance to default (DD) to proxy risk, which means that a negative connection between CEO stock options and DD refers to higher likelihood to default risk.

with longer tenure may display lower risk behaviour by choosing safe portfolio investments. This perspective is true as much of their undiversified wealth portfolio is embedded in accumulated human capital. The insignificance of the proportion of independent directors, FINBD, does not have any strong implication that the latter could be an unimportant characteristic in bank compensation policy. Yet, recent regulatory reforms, the Basel Committee on Banking Supervision, and the board conventional theory recognise the importance of independent directors in the governance of the firm.

With control variables, market-to-book ratio, MTB is negative and statistically significant across all regressions. This result implies that banks with higher charter values have fewer incentives to pursue excessive risky strategies. And consistent with moral hazard, this finding compares with those reported by Demsetz et al., (1997), Lee (2002), Anderson and Fraser (2000), and Konishi and Yasada (2004). Indeed, banks with higher charter are constrained to engage in excessive risk-taking (Keeley, 1990). Throughout the regressions, the coefficients of firm size, LNSIZE, are positive and statistically significant at better than 1%. This explains the view that greater bank risk-taking and less information risk characterise larger banking firms.

In Table 6-3(b) regression results connecting total equity-based compensation and risk are reported. Consistent with evidence in Table 6-3(a), bank risk increases with the total equity based compensation of executives. This result is supportive of H1c. Reinforcing the arguments in Table 6-3(a) above, CEO total-equity based compensation encourages risk-averse managers to pursue risky asset portfolios. Other control variables carry the same predictions. As such, the interpretation also remains qualitatively the same as in Table 6-3(a). As a whole, this empirical investigation is unable to accept the null hypothesis that managerial incentives based on equity compensation do not influence risk-taking in banks. More important, the evidence presented above provides strong support that all-stock contracts could lead risk-averse managers to undertake riskier investment projects.

Findings in Table 6-4 connect CEO vested managerial incentive compensation and debt policy. The evidence found is inconsistent with H2 and John and Qian (2003). In model (1), CEOs' total equity-based compensation affects positively regression model (1), at 10% level of significance. Consistent with Angbazo and Narayanan (1997) and Harjoto and Mullineaux (2003), leverage is positively associated with CEO stock options and is statistically significant in models (5)-(8).

The interpretation of this result is that CEOs compensated with stock options have higher incentives to implement aggressive risky debt policies. This could be due to their wealth being tied closely to the value of the banking firms, which in turn, involves them in risk-shifting behaviour. In addition, it explains the presence of deposit insurance policies that maximise the put-option value at leveraged banks. Together with the bailout schemes, bank shareholders have incentives to engage in risky activities at the expense of deposit insurance corporations and free riding depositors. The evidence is theoretically (Merton, 1977) and empirically (Saunders et al., 1990) consistent with the moral hazard hypothesis. The finding is also supportive of the argument that equity-based policies can mitigate agency monitoring costs and agents' risk-aversion behaviour (Jensen and Meckling, 1976; Smith and Stulz, 1985).

Based on the link between stock option and leverage, it may be argued that the former ownership encourages asset substitution. In effect, the risks shifted to bondholders from shareholders who desire more risks raise agency problems. Such managerial incentives to riskier debt policies may exacerbate agency conflicts between managers and shareholders and debtholders and shareholders. Controlling for the effect of boards on leverage, CEOs compensated with stock options continue to implement aggressive risky debt policies.

In models (2)-(4), the empirical analysis also found that the coefficient estimates of equity-based compensation on leverage are not significant, after controlling for board characteristics. This result compares with those in Brewer et al. (2003). Since equity-based compensation is composed of stock ownership, it may be logical to conclude that the risk-averse entrenched CEOs who are solely stock ownership-base rewarded have no incentives to implement an aggressive debt policy. That means stock options and not stock holding compensation may lead to higher leverage - i.e. an observable risk[58]. With this portrayal of facts, therefore, it is hard to draw a firm conclusion that accepts the null hypothesis that equity-based compensation and risky debt are not connected. In addition, it may be contended that legal and regulatory institutions restrain higher leverage to safeguard bank

[58] Compared to industrial firms, Berger et al. (1997) indicate a positive relationship between CEO vested option holdings and leverage. Coles et al., (2006) report a positive association between lagged CEO vega and leverage. Based on their findings, it could be argued that compensations that are linked to firm value may incentivise the CEO to select more aggressive debt strategies.

capital and financial system stability. In fact, banks' balance sheets are largely composed of debt in 90 per cent customers' deposits.

Turning to board governance, the coefficient estimates on monitoring board characteristics remain with the earlier signs except tenure which lost its statistical significance. The negative tension between board size and leverage reinforces the insight discussed above over the impact of smaller boards on risk-taking. The rest of the control variables are consistent with the earlier predictions. Return on asset, ROA is positive and statistically significant in all regression models. With this in mind, it can be explained as follows - with the reduction in assets substitution intensity which exposes debtholders to higher risk, bank profitability will tend to increase. Equally, the positive relationship supports the theory that higher risk could generate higher expected returns.

6.5.2 CEO – cash based pay

The results examining the association between the bank risk and CEO cash compensation, CEO-CS are presented in Table 6-5. As CEO cash compensation exhibits a positive correlation with natural log of banks asset size and board size, they are orthogonalised to rectify multicollinearity bias. They are defined as residual values in OLS, and denoted as BDSIZERE and ln(CEO-CBRE), respectively. Consistent with Noe et al.'s (1996) theory and at odds with the expectation, in models (1)-(4), ln(CEO-CBRE) and equity return volatility are positively related. The possible explanation for this result is that cash-based compensation provides incentives to entrenched managers to pursue risk-taking behaviour in highly leveraged banking firms. By the same token, all-cash contracts may augment the likelihood of bankruptcy in banks. However, it should be noted that this investigation does not examine banks that are in weakened financial situations, which are examined by Noe et al. (1996).

One view holds that for banking institutions, short-term fixed remuneration can also offer some convex pay-off, as do long-term equity-based pays, and thus - a risk rewarding incentive tool. This result is consistent with those by Harjoto and Mullineaux (2003) and Benston and Evan (2006), and inconsistent with those in Vallascas and Hagendorff (2010). However, Benston and Evan (2006) employ market to book value of equity to capture bank risk. Again, the theoretical model by Smith and Stulz (1985) is not supported by this result. Controlling for board

characteristics in models (2)-(4), the coefficient estimates on CEO cash compensation, retained the same negative pattern and is statistically significant. Similarly, estimates of other control variables – i.e. market to book, return on asset and natural log of bank size preserved their prior signs. Consequently, hypothesis H3a is rejected.

Similarly, Table 6-5 also presents the regression analysis of leverage on CEO cash compensation, after controlling market to book ratio, return on assets, natural log of bank size and year dummies. The estimated coefficients on CEO cash-based pay are negative and significant at the level of 1% in all specification models, (6)-(8). This finding is consistent with industrial firm evidence by Berger et al. (1997) and Coles et al. (2008)[59]. The evidence confirms the characteristics of entrenched CEOs who prefer larger fixed based compensation to converge the interests of both shareholders and debtholders. It also suggests that higher charter value constrained banks increase default risk by compensating CEOs with cash based pay. This leads to lessening the likelihood of financial distress through managerial risk shifting incentives.

As the magnitude of asset substitution is reduced, the cash compensation effect is reflected in higher bank profitability. Indeed, this is confirmed by the positive and negative coefficient estimates of the return on assets and market ratio, respectively, both statistically significant at the level of 1%. Angbazo and Narayanan (1997) and Harjoto and Mullineaux (2003) find near zero tension between cash-based compensation and leverage[60]. More important, the OLS estimate remains robust to the specification of ln(CEO-CBRE variable if board characteristics are controlled, and coefficient estimates are statistically significant. Board size enters regression models negatively and is statistically significant at a level of 1%. The evidence goes with the notion that smaller boards would encourage greater usage of capital equity than leverage, which in turn, puts shareholders' funds at more risk. This perspective takes the view that lower leverage reduces the chances of insolvency and checks bank capital adequacy status. Accordingly, H3b is accepted.

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[59] In within firm and not ordinary least squares estimates, Berger et al. (1997), CEO' model leverage (book/market value) on excess fixed compensation and indicate a negative link between them.

[60] For nonbank firms, Duru et al. (2005) indicate that CEO cash-based pay increases in leverage when bad cash return is less than the face value of a pure discount bond.

Throughout the analysis, several post estimation tests are conducted and reported in the respective tables. These tests are as follows: Wald test (*II*) to ascertain the significance coefficient estimated including year dummies. Their significance are reported in values below each parameter estimate. Multicollinearity problem – variables that are highly correlated are either winsorised or replaced. Many variance inflation factor values (VIFs) are below 5 – i.e. within acceptable figure of <10. White (1980) test standard errors test is employed to derive the heteroskedasticity consistent t-statistics.

6.5.3 Simultaneous equations: Analysis of stock options, board structure and risk

Table 6-6 of Panel A reports the 3SLS parameter estimates in four (4) simultaneous systems: CEO stock options, board size, independent board, and bank risk. The basis for this analysis is that compensation and corporate governance are endogenously determined. Results in models (1)-(4) offer potentially valuable insights. It is found that the causality effect can be run as follows: for equity return volatility and CEO stock options (Chen et al, 2006; DeYoung et al., 2010), the percentage of independent directors and CEO stock options, and the percentage of independent directors and equity return volatility (Akhigbe and Martin, 2008; Pathan, 2009). In models (1) and (2), equity return volatility and natural log of stock options value are positively associated (significant at the 1% level). In effect, higher CEO stock options compensation leads not only to higher bank risk-taking, but also, banks with higher stock volatility provide managerial compensation contracts that promote risk-taking behaviour. This evidence is comparable to that of Chen et al. (2006). It is in line with the view that securities that enhance the risk-aversion effect simultaneously increase the wealth effect of agents (Guay, 1999).

However, after controlling for the endogeneity effect, in model (1), the percentage of independent directors displays a significant negative association to risk as reported by Akhigbe and Martin (2008) and Pathan (2009). This evidence is appealing relative to that presented in the preceding tables of results (i.e., Tables 6-3 to 6-5). Moreover, it confirms the role of independent directors in banks. It suggests that the latter may shape excessive risk taking in banking firms. There are three possible explanations to this salient link: First, regardless of increase in their stock options, independent directors have fewer incentives to implement risky

policies. Second, the same directors could be more knowledgeable to the full spectrum of risk that banks are exposed to. Finally, prudential regulations in place are too loose to discipline bank managerial behaviour. Staikouras et al. (2007) reveal that loans to total assets ratio increases in proportion to non-executive directors which could have an impact on bank risk assets portfolios. Board size is negative and statistically significant on equity return volatility as indicated in the earlier tables of results.

In models (2) and (4), there is a positive relationship between the percentage of independent directors and CEO stock options (better than the 5% level of significance) that runs in both directions. This causation explains that independent directors and executive incentive compensations are not substitutes for corporate governance, as expected. As such, they are behaving in the complementarily way. It also indicates that the more independent boards effectively monitor managerial opportunistic actions. This causation implies that both managerial compensation and independent board of directors can be employed simultaneously to resolve agency conflicts. For comparability, in bank holding companies, Sierra et al. (2006) indicate a negative causality between strong board and managerial compensation[61]. Again, in model (4), a negative connection between independent directors and equity return volatility (significant at the 1% level), confirms the absence of causation between the parameters.

Other interesting results emerging from this analysis are as follows: One, in model (1), a coefficient of market-to-book ratio is negative and significant at 1%. Again, this is supportive of the moral hazard hypothesis. This can probably be interpreted as the idea that banks with favourable growth opportunities are constrained by higher charter value to take on investments with higher risks. Two, tenure is negative suggesting that even if entrenched CEOs are granted substantial stock options, yet, they are hesitant to engaging in risky strategies in banking firms. Three, in model (2), CEO stock option increases with bank size, LNSIZE. This evidence confirms the theoretical predictions that executives in large firms (i.e., measured by LNSIZEDU) should be proportionately rewarded. It is also consistent

[61] Supporting the substitution hypothesis, Agrawal and Knoeber (1996) and Mak and Li (2001) highlighted that a strong board (i.e., proportion of independent directors) is negatively related to managerial compensation (i.e., through managerial ownership) in industrial firms.

with findings reported in Chapter 3 and a documented stylised fact – that is in the quintile of the largest banks (Q5), their executives receive higher pay[62].

Four, in model (3), the relationship between board size and the percentage of independent directors is negative, and they are simultaneously determined (significant at the 1% level). This result compares with those indicated by Mak and Li (2001) in industrials, but, is inconsistent with Pathan (2009). More importantly, it is consistent with the view that greater independent board composition and smaller board size are substitutes in robust corporate governance.

Finally, to conduct this analysis two precautions are observed. One, the selected instrumental variables are based on the extant literatures (see section 6.4.3). Two, a test for endogeneity presence of CEO stock options, board size and the percentage of independent directors on bank risk is performed using the Durbin-Wu-Hausman test. This check is unable to accept the null hypothesis of no endogeneity at better than 1% level of significance.

In summary, the findings lend support to the thesis that managerial incentives, board structures, and risk are jointly determined. Indeed, the evidence implies that causation runs from managerial incentive compensation and board structure – in particular, the percentage of independent directors – to bank risk. As such, it may be logical to conclude that the link between managerial compensation and board structure is important for dealing with risk-taking in banking institutions.

6.5.4 Simultaneous equations: Analysis of stock options, board structure and leverage

Table 6-6 of Panel B presents the 3SLS parameter estimates in four (4) simultaneous systems, namely, CEO stock options, board size, the percentage of independent directors, and leverage. Again, instrumental variables are selected with care and the Durbin-Wu-Hausman test is applied to the leverage equation. This test confirms the presence of endogeneity at 1% level of significance. In model (5), the finding confirms simultaneous association between leverage and CEO stock options. Controlling for variables similar to those in Table 6-4, a positive

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[62] In Chapter 3, banks are ranked with respect to total assets and Tobin's Q portfolios, and sorted into quintiles. Q1 quintile and Q5 quintile represent banks with the lowest and highest values, respectively, of total assets and market capitalization.

relation between CEO stock options and leverage is indicated. Based on this, there is additional evidence that stock option executive incentives lead to the implementation of aggressive risky debt policy in banks. This is consistent with the finding by Angbazo and Narayanan (1997). It contrasts with those reported by Berger et al. (1997) and Coles et al. (2006) in industrial firms. Accordingly, this analysis is unable to accept the null hypothesis that bank leverage does not vary direct with CEO stock options.

Other significant findings are as follows: First, the percentage of independent directors and leverage are negatively related and endogenously determined. This can be explained in that banks with more independent directors implement a passive debt policy, and risky debt is not motivated by independent directors. Board size is positively related to leverage, rather than vice versa. This result can be interpreted as that it takes longer for large boards to conclude matters related to bank debt policies. Subsequently, banks may find themselves pursuing an aggressive debt policy that can lead to risky debt exposure. Second, contrary to the findings of Adams and Mehran (2005) and Andres and Vallelado (2008), it is found that board size is negatively related to return on assets. This result is encouraging for the popular view that smaller boards are better (Yermack, 1996).

In summary, there is evidence that CEO stock options, board structure, and leverage are also simultaneously determined. In effect, the inter-relationship of managerial incentive compensation and board structure is crucial in affecting the debt policy of banks.

6.5.5 Robustness checks

For further analysis, Panel A of Table 6-7 reports results that re-explore a set of regression specifications. This test is intended to evaluate the robustness of the potential impact of managerial incentives through board characteristics on bank risk. To conduct this check, managerial compensation's relationship to risk-taking is measured by the natural log of total CEO wealth, ln(CEOEB) as in Core and Guay (1999). The latter is defined as the summation of the values of stock ownership and stock options, and alternative variables are used. Board size is replaced by two variables: The residuals board size, BDSIZERE on firm size and the ratio of board size divided by natural log of total assets, BDLNSIZE (Anderson et al., 2004). Return on assets is replaced by Tobin's Q and return on equity. As in much of the prior literature, the age of the CEO is included in the analysis. The findings are

robust to alternative variables and model specifications employed. Throughout the models (1)-(4), as expected, the coefficient estimate of total equity-based compensation, ln(CEOEB) is positive and statistically significant. Similarly, the replaced variables for board size – BDSIZERE and BDLNSIZE are significant and retain the negative signs.

Furthermore, a subsample of the largest banks whose asset value is greater than the natural log of the median value (i.e., 21.194) of the total assets is created. A corresponding dummy variable is denoted as LNSIZEDU. It takes 1 if LNSIZE is greater than this median value, otherwise 0, and is interacted with total equity-based compensation and board characteristics variables. The question arising is to test whether managerial incentive compensation on bank risk is significantly different in large banks than in small banks.

In regression models (1) and (3) the coefficient estimates on total equity-based compensation, ln(CEOEB) are positive and insignificant, and the coefficient estimates on the interaction term, are positive and significant. This can be interpreted insofar as the impact of equity-based compensation is higher in large banks than in small banks. In other words, it implies that higher CEOs equity-based pay is linked to higher risk-taking for large banks relative to small banks. Subsequently, the null hypothesis that the sum of the coefficients of ln(CEOEB)) and its interaction term with the LNSIZEDU dummy equals to zero can be rejected. It implies that higher CEOs equity-based pay is linked to higher risk-taking in large banks relative to small banks.

As a further robustness check, a simultaneous system of equations using 3SLS is performed. Their results are presented on Table 6-8. Risk, excess stock options, board size and the percentage of independent directors are treated as endogenous in the system. The excess stock options are defined as the residual in the ordinary least square regression model as in equation (6.6):

$$Ln(CEO\text{-}OPT)_{it} = \alpha + \beta_1 \sigma_i + \beta_2 FINBD + \beta_3 BDLNSIZE + \beta_4 TENURE + \beta_5 MTB + \beta_6 MKCAP + \varepsilon \quad (6.6)$$

Variables in the model remain with the same definitions as above. Market capitalisation replaces the natural log of firm assets to measure firm size. The

results for the excess of stock options and equity return volatility in models (1) and (2) respectively provide evidence that these parameters are simultaneously determined. These findings are consistent with those reported by Chen et al. (2006), Mehran and Rosenberg (2008), and Vallascas and Hagendorff (2010). Board size to natural log of total assets ratio bears a negative sign (at a 10% level of significance). This finding is consistent with those reported in Section 6.4.3, Table 6-7. The percentage of independent directors and equity return volatility are positively associated. This result is different from that presented in Table 6-6. It could be argued that in an environment of smaller boards and larger proportions of independent directors, rewarding executives with stock options would generate risky activities in banks.

Finally, turning to CEO's total compensation, in the ordinary least squares estimator, equity return volatility positively and significantly influences the natural log of total compensation, in model (5). This finding is supportive of those indicated in Table 6-3 (a)-(b) for stock ownership, stock option and total equity-based compensation. With this depiction evidence, it is true that after lumping cash- and equity-based incentives together (see Narayanan, 1996), yet, CEO total incentives lead to risk-taking behaviour (perhaps bonus compensation contract design spurred this). Overall, several robustness techniques reveal that the results are robust to a number of alternative specifications.

6.6 Summary and Conclusions

This chapter has investigated the link between managerial incentives and bank risk. Its main purpose is to provide understanding on how compensation influences risk in banking firms. It does this by controlling board characteristics. The following conclusions have emerged from this investigation. One, consistent with Chen et al. (2006), CEO stock ownership and stock options values and equity return volatility are positive and statistically significantly associated. In contrast, total equity return volatility substantially varies with equity-based incentive compensation. That is, the combination of stock ownership and stock option compensation is consistent with the notion that managerial incentives become more aligned with those of shareholders as their wealth portfolios rise. These findings are supportive of Smith and Stulz' (1985) model that equity-based rewarding offers higher convex-payoff. Interestingly, these patterns continue regardless of the board characteristics present. The evidence suggests that risk-averse managers can be motivated by

equity-based pay to take on risky and positive net present values investment projects.

Two, leverage is positively influenced by CEO stock option value. This linkage suggests that stock option compensations are more important in inducing managers to implement aggressive debt policies that generate risky debt. Three, consistent with, Harjoto and Mullineau (2003), cash-based compensation impacts positively and negatively in equity return volatility and leverage, respectively. Four, whilst the principal-agent model drives the results, the further analysis carried out suggests other theories had an impact on the analysis of managerial incentives and risk-taking in banks - in particular, the moral hazard hypothesis. In this competing view, Keeley (1990) posits that higher charter value constrained banks pursue risky strategies to exploit risky investment opportunities. Many of the regression models, the coefficient estimates on market to book ratio are negative - indicating higher charter value discourages excessive risk-taking as the result of managerial incentive compensation.

Finally, throughout, board size is negative and statistically related to bank risk and risky debt. The argument goes that smaller boards can effectively monitor managers for bank shareholders' and other stakeholders' interests. An alternative view is that large boards may come up with extreme decisions that possibly are increasing risk and aggravating the bank's positions. Turning to banks size, throughout it is indicated that positively natural log of firm size affects both equity return volatility and leverage. This goes with the argument that larger banks compensated their CEOs highly, which, in turn, induces risk-averse managers to pursue risk strategies leading to banks' value maximisation for shareholders.

In conclusion, there is compelling evidence that managerial incentive compensation significantly influences risk and the possibility of risky debt in banking firms. These bankers' pay contracts – both in cash and equity packages - are excessively generating banks' risk and risky debt. This probably means that to minimise the risks identified, more commitment is needed in the on-going compensation scheme reforms in the financial sector. The aim here is to shape bank managerial incentives appropriately in the context of excessive risk-taking. As a result, the findings in this empirical chapter have got policy implications in terms of bankers' compensation. It is proposed, therefore, that bankers' pay contracts should consider both shareholders' value maximisation as well as the banks'

volatility assets. Finally, this investigation can be replicated for future research ex-post the 2007-09 global financial crises.

Appendix III. Bank risk and executive compensation variables

Variables	Definition
Dependent variables	
Bank risks (policy measures)	
σ_i	Equity return volatility calculated as standard deviation of daily equity returns capturing for uncertainty.
LEV	Total debt to total assets ratio, measures of financial leverage.
Managerial incentive compensation variables	
Ln(CEO-CB)	Natural log of the sum of annual bonus and salary compensation to CEO.
Ln(CEO-STOCK)	Natural log of stock ownership compensation value to CEO valued as the number of stock granted multiplied by the closing price as at 31 December each year.
Ln(CEO-OPT)	Natural log of Black and Scholes value of stock options compensation to CEO
Ln(CEOEB)	Natural log of total equity-based compensation to CEO which includes common stock value and Black and Scholes value of stock options
lnTC	Natural log of the summation of cash-based, stock ownership and stock options values
Board characteristic variables	
BDSIZE	The total number of board of directors on board.
FINBD	Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size.
TENURE	Measures number of years served by current CEO.
SPLIT	A dummy variable equals to 1 where chairman is also the CEO, or
otherwise 0.	
Control variables	
LNSIZE	Natural logarithm of total assets of the bank, a proxy for bank size.
ROA	Return on equity is defined as net income divided by equity ratio.
MTB	Market to book ratio, a proxy to control for investment opportunities.
Year dummy	D2000-D2005 captures intertemporal variations in market conditions, tax effect and institutional framework effect

Table 6-1 Sample Summary Statistics

This table presents two *dependent variables* for risk, $Risk_{it}$ measures in sample size of 301 BHCs in the 2000 to 2005: Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns, and total debt to total assets ratio, measures of leverage labelled as LEV. *Independent variables:* Managerial incentive compensation include the following: Natural log of stock ownership compensation value to CEO, labelled as ln(CEO-STOCK). Natural log of Black-Scholes value of stock options compensation to CEO, labelled as ln(CEO-OPT). Natural log of total equity-based compensation to CEO which includes common stock value and Black-Scholes value of stock options, labelled as ln(CEOEB). Natural log of the sum of annual bonus and salary compensation to CEO, denoted as ln(CEO-CB). Total compensation is the natural log of the summation of cash-based, stock ownership and stock options values, denoted as ln(TC). Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. *Control variables:* Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Return on equity is defined as net income divided by equity, ROE. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE. Market to book ratio, return on asset, return on equity, CEO stock ownership value, stock options value, and CEO equity-based compensation are winsorised at 1st and 99th percentiles.

Variable	N	Mean	Median	Std.dev	Min	Max
Panel A: Risk measures(policy measures)						
σ	1478	20.76	19.71	6.27	5.23	67.96
LEV (%)	1746	13.94	12.36	9.42	0.00	62.47
Panel B: Managerial incentive compensation						
CEO-STOCK ($mil)	1805	22.70	1.76	53.10	0.00	200.00
ln CEO-STOCK	1718	14.67	14.51	2.33	0.00	19.12
CEO-OPT ($mil)	1805	9.33	17.50	8.45	0.00	17.50
ln CEO-OPT	1805	14.27	16.68	2.90	0.00	16.68
CEOEB ($mil)	1805	32.00	17.70	55.20	0.00	218.00
lnCEOEB	1805	15.95	16.69	2.02	0.00	19.20
CEO-CB ($mil)	1805	0.82	0.38	1.38	0.00	6.88
ln(CEO-CB)	1747	13.04	12.86	0.99	0.00	15.74
TC ($mil)	1747	32.20	17.70	55.90	0.00	218.00
lnTC	1747	15.92	16.69	2.04	0.00	19.20
Panel C: Board characteristics						
BDSIZE (number)	1755	12.01	11.00	4.19	4.00	33.00
FINBD (%)	1755	75.76	78.57	13.74	20.00	96.00
TENURE (years)	1756	8.72	7.00	7.99	0.00	49.00
Panel D: Control variables						
MTB	1805	2.67	2.21	1.36	0.51	4.64
ROA (%)	1805	1.47	1.45	0.64	-0.82	2.95
ROE (%)	1805	12.07	12.49	6.33	-18.73	25.90
TA ($bil)	1782	19.09	1.07	107.89	0.01	1,494.40
LNSIZE	1782	21.19	20.80	1.70	16.34	28.03

Table 6-2 Correlation Matrix

In this table we present the pair correlation between variables. *Independent variables:* Managerial incentive compensation include the following: Natural log of stock ownership compensation value to CEO, labelled as ln(CEO-STOCK). Natural log of Black-Scholes value of stock options compensation to CEO, labelled as ln(CEO-OPT). Natural log of total equity-based compensation to CEO which includes common stock value and Black-Scholes value of stock options, labelled as ln(CEOEB). Natural log of the sum of annual bonus and salary compensation to CEO, denoted as ln(CEO-CB). Total compensation is the natural log of the summation of cash-based, stock ownership and stock options values, denoted as ln(TC). Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. *Control variables:* Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Return on equity is defined as net income divided by equity, ROE. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE..

	ln(CEO-STOCK)	ln(CEO-OPT)	ln (CEOEB)	ln(CEO-CB)	ln(TC)	BDSIZE	FINBD	TENURE	MTB	ROE	ROA
ln(CEO-OPT)	0.2319*										
ln(CEOEB)	**0.6874***	**0.7717***									
ln(CEO-CB)	**0.5396***	0.0728*	0.2848*								
ln(TC)	**0.6959***	**0.7712***	1.0000*	0.2848*							
BDSIZE	0.1178*	0.010	0.0494*	**0.3196***	0.0576*						
FINBD	-0.0951*	-0.1043*	-0.1034*	0.000	-0.1051*	0.1493*					
TENURE	0.2034*	-0.0275*	0.0973*	0.0764*	0.1075*	0.0354*	-0.0353*				
MTB	0.1216*	0.1027*	0.1561*	0.0510*	0.1597*	-0.1138*	-0.011	0.0645*			
ROE	0.2109*	-0.0507*	0.0579*	**0.3355***	0.0630*	0.0203*	-0.0356*	0.1431*	0.2098*		
ROA	0.1845*	-0.0235*	0.0683*	0.2670*	0.0662*	-0.0183*	-0.009	0.0842*	0.1393*	**0.6812***	
LNSIZE	**0.4467***	0.0491*	0.2098*	**0.6813***	0.2099*	**0.4313***	0.0305*	0.010	-0.0507*	**0.3479***	0.2679*

Asterisk * indicates statistical significance at the level of 5%.

Table 6-3 (a) Regression results of stock ownership, stock options, and equity return volatility

Ordinary least square regression coefficients for models of bank risk in sample size of 301 BHCs in the 2000 to 2005 are reported in two panels: *Dependent variable:* Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns *Independent variables:* Managerial incentive compensation include the following: Natural log of stock ownership compensation value to CEO, labelled as ln(CEO-STOCK). Natural log of Black-Scholes value of stock options compensation to CEO, labelled as ln(CEO-OPT). Board size is total number of board of directors on board denoted as BDSIZE. Residual of board size is total number of board of directors on board denoted as BDSIZERE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. *Control variables:* Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

								σ_i
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Ln(CEO-STOCK)	0.282***	0.337***	0.454***	0.454***				
	(3.142)	(3.689)	(4.994)	(4.994)				
Ln(CEO-OPT)					0.179***	0.183***	0.181***	0.181***
					(3.273)	(3.395)	(3.391)	(3.391)
BDSIZE		-0.186***	-0.167***			-0.228***	-0.227***	
		(-3.900)	(-3.549)			(-4.614)	(-4.584)	
BDSIZERE				-0.167***				-0.227***
				(-3.549)				(-4.584)
FINBD			-0.001	-0.001			-0.003	-0.003
			(-0.050)	(-0.050)			(-0.239)	(-0.239)
TENURE			-0.085***	-0.085***		-0.072***	-0.072***	-0.072***
			(-5.278)	(-5.278)		(-4.281)	(-4.310)	(-4.310)
MTB	-0.774***	-0.817***	-0.790***	-0.790***	-0.725***	-0.761***	-0.762***	-0.762***
	(-5.398)	(-5.542)	(-5.422)	(-5.422)	(-4.473)	(-4.666)	(-4.664)	(-4.664)
ROA	0.490	0.351	0.419	0.419	0.215	0.103	0.106	0.106
	(1.149)	(0.842)	(1.017)	(1.017)	(0.482)	(0.234)	(0.241)	(0.241)
LNSIZE	0.508***	0.687***	0.642***	0.464***	0.417***	0.654***	0.654***	0.412***
	(5.080)	(6.181)	(5.778)	(4.652)	(4.070)	(5.792)	(5.807)	(4.031)
Constant	11.659***	10.393***	11.775***	13.533***	11.366***	10.000***	10.225***	12.613***
	(5.448)	(5.012)	(5.375)	(6.234)	(4.851)	(4.138)	(4.187)	(5.230)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included
R-squared	0.070	0.087	0.100	0.100	0.051	0.080	0.080	0.080
Adj. R-squared	0.064	0.081	0.092	0.092	0.046	0.073	0.073	0.073
Wald test	17.93***	16.28***	16.39***	16.39***	12.48***	13.89***	12.03***	12.03***
II: F-test	4.81***	6.14***	5.68***	5.68***	4.71***	5.71***	5.59***	5.59***
#Obs.	1,402	1,382	1,382	1,382	1,476	1,456	1,456	1,456

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 6-3 (b) Regression results of total equity-based compensation and equity return volatility

Ordinary least square regression coefficients for models of bank risk in sample size of 301 BHCs in the 2000 to 2005 are reported. *Dependent variable:* Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns. *Independent variables:* Natural log of total equity-based compensation to CEO which includes common stock value and Black-Scholes value of stock options, labelled as ln(CEOEB). Board size is total number of board of directors on board denoted as BDSIZE. Board size is total number of board of directors on board denoted as BDSIZE. Residual board size is total number of board of directors on board denoted as BDSIZERE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. *Control variables:* Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

				σ_i
VARIABLES	Model	Model	Model	Model
Ln(CEOEB)	0.190**	0.217**	0.260***	0.260***
	(1.972)	(2.219)	(2.687)	(2.687)
BDSIZERE		-0.235***	-0.222***	
		(-4.741)	(-4.506)	
BDSIZE				-0.222***
				(-4.506)
FINBD			-0.002	-0.002
			(-0.185)	(-0.185)
TENURE			-0.081***	-0.081***
			(-4.794)	(-4.794)
MTB	-0.724***	-0.780***	-0.761***	-0.761***
	(-4.469)	(-4.730)	(-4.664)	(-4.664)
ROA	0.175	-0.022	0.086	0.086
	(0.390)	(-0.050)	(0.197)	(0.197)
LNSIZE	0.389***	0.384***	0.354***	0.590***
	(3.860)	(3.856)	(3.474)	(5.293)
Constant	11.557***	11.808***	12.408***	10.068***
	(4.560)	(4.667)	(4.826)	(3.903)
Year dummy	Included	Included	Included	Included
R-squared	0.048	0.068	0.079	0.079
Adj. R-squared	0.042	0.062	0.071	0.071
Wald test	10.69***	11.96***	12.35***	12.35***
II: F-test	4.61***	6.05***	5.59	5.59
#Obs.	1,476	1,456	1,456	1,456

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table 6-4 Regression results of total equity-based compensation, stock options and leverage

Ordinary least square regression coefficients for models of bank risk in sample size of 301 BHCs in the 2000 to 2005 are reported in two panels: *Dependent variable* leverage is total debt to total assets ratio, measures of risky debt labelled as LEV. *Independent variables:* Natural log of total equity-based compensation to CEO which includes common stock value and Black-Scholes value of stock options, labelled as ln(CEOEB). Natural log of Black-Scholes value of stock options compensation to CEO, labelled as ln(CEO-OPT). Board size is total number of board of directors on board denoted as BDSIZE. The residual board size is total number of board of directors on board denoted as BDSIZERE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. *Control variables:* Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

	leverage (LEV)							
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Ln(CEOEB)	0.187*	0.133	0.141	0.141				
	(1.886)	(1.317)	(1.359)	(1.359)				
Ln(CEO-OPT)					0.170**	0.153**	0.158**	0.158**
					(2.560)	(2.292)	(2.318)	(2.318)
BDSIZE				-0.139***		-0.138***	-0.142***	
				(-2.771)		(-2.724)	(-2.810)	
BDSIZERE		-0.137***	-0.139***					-0.142***
		(-2.717)	(-2.771)					(-2.810)
FINBD			0.006	0.006			0.008	0.008
			(0.364)	(0.364)			(0.463)	(0.463)
TENURE			-0.005	-0.005		-0.001	0.000	0.000
			(-0.182)	(-0.182)		(-0.020)	(0.007)	(0.007)
MTB	-0.599***	-0.670***	-0.670***	-0.670***	-0.596***	-0.676***	-0.677***	-0.677***
	(-3.644)	(-4.036)	(-4.026)	(-4.026)	(-3.686)	(-4.133)	(-4.129)	(-4.129)
ROA	2.655***	2.491***	2.500***	2.500***	2.704***	2.543***	2.543***	2.543***
	(6.609)	(6.053)	(5.986)	(5.986)	(6.707)	(6.100)	(6.104)	(6.104)
LNSIZE	1.924***	1.969***	1.965***	2.113***	1.951***	2.130***	2.133***	1.982***
	(15.335)	(15.461)	(15.141)	(15.249)	(16.081)	(15.779)	(15.882)	(15.960)
Constant	-	-	-	-	-	-	-	-
	33.170***	30.517***	30.982***	32.447***	33.263***	32.388***	33.050***	31.554***
	(-12.927)	(-11.362)	(-10.888)	(-11.166)	(-13.095)	(-11.852)	(-11.493)	(-11.175)
Year dummy	Included	Included	Included	Included	Included	Included	Included	Included
Observations	1,734	1,695	1,695	1,695	1,734	1,695	1,695	1,695
R-squared	0.206	0.213	0.213	0.213	0.207	0.214	0.214	0.214
Adj. R^2	0.202	0.208	0.207	0.207	0.203	0.209	0.209	0.209
Wald test	145.08***	188.44***	85.46***	85.46***	145.08***	98.02***	84.95***	84.95***
II: F-test	2.94**	2.87**	2.87***	2.87***	2.97***	5.70***	2.89***	2.89***
#Obs.	1,734	1,695	1,695	1,695	1,734	1,695	1,695	1,695

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 6-5 Regression results CEO cash compensation, equity return volatility, and leverage

Ordinary least square regression coefficients for models of bank risk and debt risky in sample size of 301 BHCs in the 2000 to 2005 are reported. Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns, and total debt to total assets ratio, measures of leverage labelled as LEV. *Independent variables:* Natural log of the sum of annual bonus and salary compensation to CEO, denoted as ln(CEO-CB). The residual of board size is total number of board of directors on board denoted as BDSIZERE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. *Control variables:* Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

	σ_i						Leverage (LEV)	
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ln(CEO-CB).	0.967**	1.679***	1.839***	1.839***	-0.496	-1.592***	-1.604***	-1.604***
	(2.465)	(3.371)	(3.691)	(3.691)	(-1.408)	(-3.742)	(-3.762)	(-3.762)
BDSIZERE		-0.195***	-0.176***	-0.176***		-0.156***	-0.155***	-0.155***
		(-4.040)	(-3.680)	(-3.680)		(-2.969)	(-2.941)	(-2.941)
FINBD			-0.009	-0.009			-0.003	-0.003
			(-0.805)	(-0.805)			(-0.199)	(-0.199)
TENURE			-0.093***	-0.093***			0.005	0.005
			(-5.550)	(-5.550)			(0.186)	(0.186)
MTB	-0.621***	-0.683***	-0.667***	-0.667***	-0.557***	-0.614***	-0.615***	-0.615***
	(-3.852)	(-4.182)	(-4.136)	(-4.136)	(-3.398)	(-3.727)	(-3.725)	(-3.725)
ROA	-0.076	-0.316	-0.209	-0.209	1.986***	1.921***	1.915***	1.915***
	(-0.143)	(-0.608)	(-0.412)	(-0.412)	(4.369)	(4.170)	(4.131)	(4.131)
LNSIZE	0.387***	0.368***	0.344***	0.344***	1.971***	2.044***	2.046***	2.046***
	(3.824)	(3.656)	(3.411)	(3.411)	(15.949)	(16.549)	(16.450)	(16.450)
Constant	14.381***	15.840***	17.628***	17.628***	-	-	-	-
					27.827***	30.576***	30.395***	30.395***
	(6.606)	(7.197)	(7.624)	(7.624)	(-10.489)	(-11.743)	(-11.083)	(-11.083)
R-squared	0.043	0.069	0.084	0.084	0.195	0.208	0.208	0.208
Adj. R-squared	0.037	0.062	0.076	0.076	0.190	0.203	0.202	0.202
Wald test	4.20***	15.05***	14.69***	14.69***	139.90***	114.23***	82.15***	82.15***
II: F-test	11.15***	5.97***	5.28***	5.28***	3.11***	3.50***	3.49***	3.49***
#Obs.	1,376	1,358	1,358	1,358	1,643	1,610	1,610	1,610

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table 6-6 Simultaneous equations (3SLS): equity returns volatility, CEO incentive, and board characteristics

Simultaneous regression models of equity return volatility, leverage, CEO stock options, board size and percentage of independent directors are reported. Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns, and leverage is total debt to total assets ratio, measures of risky debt labelled as LEV. Natural log of Black-Scholes value of stock options compensation to CEO, labelled as ln(CEO-OPT). Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. Split is a dummy variable equals to 1 where chairman is also the CEO, or otherwise 0, denoted as SPLIT. The natural log of age of CEO in years is labelled as LNAGE. Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Total risk based capital ratio is defined as the summation of tier 1 and 2 capital divided by weighted risk assets, CART. A dummy variable denoted as LNSIZEDU takes 1 if LNSIZE is greater than this median value, otherwise 0. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE.

	Panel A: σ, stock option, board size, and %independent directors				*Panel B:* Leverage, stock option, board size, and %independent directors			
VARIABLES	σ	CEO-OPT	BDSIZE	FINBD	LEV	CEO-OPT	BDSIZE	FINBD
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
σ		0.240***	-0.035	-1.453***				
		(5.834)	(-0.240)	(-4.861)				
LEV						-0.302***	0.411***	-1.837***
						(-10.198)	(6.404)	(-3.601)
Ln(CEO-OPT)	1.371***		1.696***	8.164***	-2.865***		0.989***	-2.721
	(3.919)		(5.666)	(11.464)	(-11.463)		(3.422)	(-1.532)
BDSIZE	-0.797***	0.728***		-5.732***	-0.639	-0.105		-2.817***
	(-2.753)	(6.169)		(-8.913)	(-1.247)	(-0.551)		(-4.237)
FINBD	-0.019	0.107***	-0.141***		-0.258***	-0.050	-0.061	
	(-0.309)	(6.042)	(-2.768)		(-2.889)	(-1.390)	(-1.114)	
TENURE	-0.072***	0.007			0.022	0.009		
	(-3.305)	(1.425)			(1.033)	(0.950)		
SPLIT				-1.335				-0.243
				(-1.636)				(-0.601)
LNAGE			0.462				0.046	
			(1.429)				(0.363)	
MTB	-1.293***	0.662***	-0.788***	-4.984***	0.328	0.163	-0.466***	-0.597
	(-5.746)	(5.995)	(-4.084)	(-6.710)	(1.001)	(1.420)	(-2.816)	(-0.925)
ROA			0.114				-1.290***	
			(0.339)				(-3.052)	
CART			-0.010				-0.009	
			(-0.370)				(-0.487)	
LNSIZEDU			0.910***				0.052	
			(2.628)				(0.112)	
LNSIZE	0.777**	-0.461***		3.558***	3.790***	1.076***		8.265***
	(2.306)	(-3.396)		(4.440)	(6.746)	(4.491)		(5.765)
#Obs.	1,165	1,165	1,165	1,165	1,324	1,324	1,324	1,324
R-squared	0.890	0.897	0.731	0.768	0.459	0.923	0.767	0.895

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table 6-7 Robustness test - Regression results CEO total equity compensation and equity return volatility, and leverage

Ordinary least square regression coefficients for models of bank risk and debt risky in sample size of 301 BHCs in the 2000 to 2005 are reported. Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns. *Independent variables:* Natural log of the sum of annual bonus and salary compensation to CEO, denoted as ln(CEO-CB). Board size is total number of board of directors on board denoted as BDSIZE. Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. *Control variables:* Return on equity is defined as net income divided by equity, ROE. Natural logarithm of total assets of the bank, a proxy for bank size, denoted as LNSIZE. The natural log of age of CEO in years is labelled as LNAGE. Tobin's Q is denoted as q and defined as market value of equity plus total liabilities divided total assets. Board size is redefined as number of board divided by natural log of total asset, BDLNSIZE (Anderson et al., (2004). LNSIZEDU takes 1 if LNSIZE is greater than the median for all firms, otherwise 0 LNSIZEDU takes 1 if LNSIZE is greater than the median for all firms, otherwise 0. Year dummies are time dummies. Wald test indicates the significance of all coefficients excluding constant. *II* is the Wald test F-statistics represents for the joint significance of the year fixed-effects. The heteroskedasticity consistent t-statistics, derived from White (1980) standard errors, are in parentheses below each parameter estimate.

Variables	Model 1	Model 2	Model 3	σ Model 4
Ln(CEOEB)	0.129	0.205**	0.121	0.210**
	(1.232)	(1.974)	(1.126)	(2.001)
BDSIZERE	-0.224***	-0.236***		
	(-2.630)	(-2.950)		
FINBD	0.018	0.024	0.015	0.022
	(1.182)	(1.590)	(1.018)	(1.433)
TENURE	-0.076***		-0.076***	
	(-3.208)		(-3.230)	
ROE	-0.114***		-0.114***	
	(-5.776)		(-5.767)	
LNSIZE	0.282**		0.376***	
	(2.005)		(2.625)	
LNAGE		-2.320***		-2.304***
		(-10.808)		(-10.806)
q		-3.225		-2.778
		(-1.149)		(-0.997)
BDLNSIZE			-3.910**	-3.751**
			(-2.334)	(-2.459)
Ln(CEOEB)*LNSIZEDU	0.237**	0.254**	0.254**	0.265**
	(2.407)	(2.574)	(2.224)	(2.441)
BDLNSIZE*LNSIZEDU			-0.998	-0.360
			(-0.502)	(-0.193)
BDSIZERE*LNSIZEDU	0.025	0.049		
	(0.245)	(0.514)		
FINBD*LNSIZEDU	-0.037*	-0.030	-0.033*	-0.027
	(-1.943)	(-1.495)	(-1.694)	(-1.313)
TENURE*LNSIZEDU	0.009		0.009	
	(0.269)		(0.290)	
Constant	13.750***	28.156***	14.251***	29.712***
	(4.355)	(7.346)	(4.492)	(7.299)
Year dummy	Included	Included	Included	Included
R-squared	0.112	0.177	0.112	0.174
Adj. R-squared	0.103	0.170	0.102	0.166
#Obs.	1,455	1,390	1,455	1,390

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table 6-8 Robustness test - Regression results CEO options compensation, board characteristics and equity return volatility

Simultaneous regression models of equity return volatility, residual CEO stock options, board size and percentage of independent directors are reported. Equity return volatility denoted as σ_i and calculated as standard deviation of daily equity returns, and leverage is total debt to total assets ratio. The residual natural log of Black-Scholes value of stock options compensation to CEO, labelled as ln(CEO-OPT)RE is defined in equation 6.6. Board size is redefined as number of board divided by natural log of total asset, BDLNSIZE (Anderson et al., (2004). Fraction of independent directors refers to the fraction of board seats held by non-officers without relationship to the founding family divided by the board size and labelled as FINBD. Tenure captures number of years served by current CEO, labelled as TENURE. Split is a dummy variable equals to 1 where chairman is also the CEO, or otherwise 0, denoted as SPLIT. The natural log of age of CEO in years is labelled as LNAGE. Market to book ratio, a proxy to control for investment opportunities is denoted as MTB. Return on assets is calculated as profit before interest and tax divided by book value of assets, ROA. Total risk based capital ratio is defined as the summation of tier 1 and 2 capital divided by weighted risk assets, CART. A dummy variable denoted as LNSIZEDU takes 1 if LNSIZE is greater than this median value, otherwise 0. Natural logarithm of market capitalisation is the number of share multiplied by total outstanding shares, denoted as LNMKCAP. In model (5), ordinary least squares regression model shows the sensitivity of equity return volatility to total compensation of the CEO. Total compensation is defined as the natural log of the summation of cash-based, stock ownership and stock options values, denoted as ln(TC). The residual board size is total number of board of directors on board denoted as BDSIZERE.

VARIABLES	σ	ln(CEO-OPT)RE	BDLNSIZE	FINBD	σ
	Mode 1	Model 2	Model 3	Model 4	Model 5
σ		0.112***	-0.036***	2.469***	
		(4.339)	(-4.807)	(6.844)	
LNCEOPTVRE	2.474***		0.227***	-15.891***	
	(2.972)		(7.662)	(-8.973)	
lnTC					0.279***
					(2.854)
BDSIZERE					-0.207***
					(-4.156)
FINBD	0.306***	-0.050***	0.022***		-0.007
	(8.419)	(-12.196)	(7.148)		(-0.607)
BDLNSIZE	0.659	-1.319		-23.404	
	(0.109)	(-0.782)		(-0.907)	
TENURE	-0.068***	-0.004			-0.088***
	(-3.083)	(-1.545)			(-5.117)
LNAGE			-0.013		
			(-1.022)		
SPLIT				-0.377	
				(-0.453)	
MTB	-0.812***	0.094	-0.056***	1.861*	-0.690***
	(-3.141)	(1.319)	(-4.960)	(1.687)	(-4.137)
ROA			-0.052***		0.020
			(-3.607)		(0.044)
CART			-0.006***		
			(-3.590)		
LNSIZEDU			0.048***		
			(3.332)		
LNMKTCAP	-0.018	0.102**		1.719***	
	(-0.117)	(2.243)		(2.756)	
LNSIZE					0.264**
					(2.565)
R-squared	0.789	-0.127	-0.417	0.605	0.072
#Obs.	1,165	1,165	1,165	1,165	1,405

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Chapter 7: Conclusions and Implications for Future Research

7.1 Introduction

This Chapter concludes the thesis. It presents a summary and an overview of the main results for the empirical analysis carried out in Chapters 4-6. It also examines the strengths, weaknesses and policy implications of this study and, additionally, the agenda for further research is analysed. The objective of this thesis was to investigate corporate governance and its effect on risk-taking in US bank holding companies. This goal has been achieved. It is worth taking into consideration the following aspects: Firstly, the thesis has a stand-alone literature review in Chapter 2, which discusses corporate governance in financial institutions, as well as surveying relevant industrial governance literature. At the end of each sub-section, a summary, a table summarising the report into sub-headings and surfaced stylised facts are provided. Finally, a section of literature gap closes this chapter.

An empirical study on distance to default, subordinated debt, and market discipline in the banking industry, is presented in Chapter 4 – and it is published in *Accounting and Finance* 50, (2010) pp. 853-870. Empirical analyses for Chapters 5 and 6 utilise the same sample data set, presented and described in Chapter 3, under “Data Collection and Construction of Variables”. The remainder of this Chapter is organised as follows: The next section recaps the motives behind this investigation. Section 7.3 summarises contribution to the thesis and proffer diverse policy implications. Section 7.4 summarises the main empirical results. Section 7.5 discusses the strengths and weaknesses of this investigation, in addition to setting out an agenda for further research.

7.2 Research Background and Motivations

Amidst the deregulated banking background resulting from regulatory reforms in the late 1990s, financial products and the size of financial firms became increasingly complex. As a consequence of the more integrated banking system and volatile environment, banks were exposed to exploit new investment opportunity sets. As such, they transited their operations to unsafe and risky lending avenues (Pathan, 2009; DeYoung et al., 2010; Mehran et al., 2011).

However, these new lines of banking business generated potential non-interest income. In contrast, non-banking firms shifted to traditional banking activities. This move significantly intensified competition between commercial banks and non-banking firms, even though regulations were in place. This study takes forward the topical discussion and arguments over corporate governance efficacy in shaping excessive bank risk-taking.

From the above arguments, the key research question is whether corporate governance of banks influences risk-taking behaviour. Thus, this investigation is essentially stimulated by the following deliberations. One, given the increasingly excessive risk-taking behaviour of financial institutions, the bank failures and the continuing financial crisis; few academic works have closely examined corporate governance of banks[63]. In addition to this, they have produced contradictory findings. Most importantly, bank governance research analysis focuses on a single agency conflict control mechanism for bank risk (see Tables 2-1 and 2-4).

For example, there are studies that look at the effect of ownership structure (i.e., Saunders et al. 1990; Chen et al., 1998; Laeven and Levine, 2009; and others); institutional ownership effect (i.e., Cebenoyan et al., 1995; Gorton and Rosen, 1995; Knopf and Teall, 1996); large institutional investor on board effect (i.e., Laeven and Levine, 2009); market discipline (i.e., Avery et al., 1988; 1990; Flannery and Sorescu, 1996; Flannery, 1998; Evanoff and Wall, 2001; Sironi, 2003; Krishnan et al., 2005; Gropp et al., 2006; Akhigbe et al. 2007; among others); board structure relevance (i.e., Staikouras et al., 2007; Akhigbe and Martin, 2008; Pathan, 2009) and executive compensation impact (i.e., Houston and James, 1995; Angbazo and Narayanan, 1997; Harjoto and Mullineaux, 2003; Chen et al. 2006; DeYoung et al., 2010; Vallascas and Hagendorff, 2010, and others).

Moreover, although market discipline has been widely examined with regard to bank subordinated debts and debentures yield spreads; its role with regard to distance-to-default indicator remains an empirical question. Only two papers by Gropp et al. (2006) and Akhigbe et al. (2007) utilise distance-to-default to

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[63] For instance, according to the FDIC's statistics, the bank collapse rate increased exponentially over the period from 2007-July 2012. More importantly, a sizeable number of these banks were casualties of the subprime property market collapse during the period 2008-2010 (see Figure 1-1). The general consensus surrounding these failures is that excessive bank risk-taking and ill-fated decisions endangered both the financial sector and economic prospects. Consequently, the extent and the effectiveness of the financial safety net and of corporate governance systems in shaping bank risk-taking are enormously important.

investigate the presence of market discipline in banks. Banks differ from non-financial firms in a number of aspects. Banks are highly regulated, dominated by informational opacity assets (risky loan portfolios) and many operate under bank holding companies (Morgan, 2002). These insights suggest that generalisations cannot be made with regard to the corporate governance of banks. Three, the excessive remuneration packages of top bank executives also motivates this research. The current system of compensation contract design – i.e. excessive bonuses - has been attacked by politicians, taxpayers and policymakers alike. Lastly, policy deliberation is another of the aims of this investigation.

In general, the areas which have not been as extensively examined with regard to risk taking by bank holding companies are boards, compensation and sub-debt distance-to-default. In theory, the interaction of these diversity governance forces is preferred in reducing agency problems and enhancing firm value (see Figure 2-1). Gramm-Leach-Bliley Act of 1999 and Basel 2, the BCBS (2006) all emphasise on the sound corporate governance of banks. Therefore, promoting better corporate governance of banks is far more important than before. With this in mind and using bank and governance-level data of the US bank holding companies, my thesis analyses the following ideas. First, it examines whether bank risk-fundamentals explain the extent of distance-to-default in sub-debt banks as compared to banks that have not issued subordinated debt. Second, it investigates whether board and ownership governance affects risk-taking behaviour. Finally, it analyses whether managerial compensation incentives lead to risk taking. Hence, investigation on the link between risk and corporate governance in banks is imperative today.

7.3 Contribution to and Discussion in the Thesis

The thesis makes five primary contributions to the corporate governance of bank literature. Firstly, the thesis provides discussion and understanding of the relevance of corporate governance of banks on risk-taking behaviour - i.e. the overall contribution. The corporate governance elements examined include board and ownership, executive compensation, and market discipline. These diverse economic and legal institutions can work together, to limit banks engaging in riskier strategy choices, which, in turn maximises the value of the firm for shareholders. However, extant empirical research analyses the connection between corporate governance elements and bank risk-taking separately. With this, reference is made to Tables 2-1 to 2-4. In examining this tension, accounting and market-based

information are utilised to proxy risk. It is shown that corporate governance of banks is important in risk-taking behaviour. Interestingly, the impact of corporate governance of banks on performance is broadly discussed. These facts are provided by Adams and Mehran (2003), Adams and Mehran (2005), Sierra et al. (2006), Akhigbe and Martin (2006), Staikouras et al. (2007), and Andres and Vallelado (2008) for board structure, and Glassman and Rhoades (1980), Pi and Timme (1993), Schranz (1993), Mudambi and Nicosia (1998), Caprio et al., (2007), and Elyasiani and Jia (2008) for ownership structure.

Secondly, the thesis constructs a distance-to-default indicator, which is a market risk-based metric to predict and compare bank distress in sub-debt and non sub-debt bank holding companies. Distance-to-default ranks higher to sub-debt yield spreads (Gropp et al., 2004). It captures the market value, leverage and asset volatility of the firm (Vassalou and Xing, 2004; Gropp et al., 2004; Gropp et al., 2006). To these papers, the thesis adds the distance to default predictability comparison of different sub-samples. This evaluation is of particular interest to the supervisory authorities. Market indicators are seen by monitoring agencies as complementary to traditional accounting data as a means of assessing bank fragility. If changes in distance to-default indicator is significant, private sector investors in bank sub-debt instruments will penalise banks by demanding higher risk premia. In turn, this behaviour of sub-debt investors is a message to supervisors to take prompt remedial actions, and is supportive of market discipline hypothesis.

Thirdly, it analyses the relationship between board and ownership governance and bank balance risk and its reflection on banks' risk exposure. The information embodied in capital adequacy, assets quality and liquidity volatility indicators are regulatory-based. Indeed, this information is vitally important to both regulators and boards in assessing financially unhealthy banks. From a regulatory and supervisory context, any deterioration detected in capital, credit portfolio, and liquidity will necessitate immediate action.

Fourthly, my thesis analyses the connection between CEO compensation and bank risk-taking through board governance. Limited evidence has been presented on the effect of managerial compensation incentives on bank risk-taking, and such findings have been controversial (Houston and James, 1995; Chen et al. 2006; Mehran and Rosenberg, 2008; DeYoung et al., 2010; Vallascas and Hagendorff, 2010). Board structure is analysed along with bankers' pay as both are cited to

have triggered excessive risk-taking in banks. More importantly, boards are involved in the establishment of managerial incentive compensation schemes and they are the apex of the governance internal control system. Therefore, evidence presented in this thesis adds to the bank compensation research by analysing the impact of managerial compensation incentives on risk-taking.

Finally, and perhaps most importantly, these findings throw new light on policy implications for a range of emerging issues in the *ex-post* banking and financial crisis environment. There seems little doubt of the need to formulate a number of strategies for the survival and sustainability of the overall financial system. The role of banks in spearheading economic growth and development are well-known. It ranges from crucial financial intermediation, monetary policy, payment system, liquidity creation, information gathering, maturity and denomination transformation of illiquid assets, to borrowers' monitoring functions. What policy lessons can be drawn from this thesis? The following are, I believe, the policy lessons which can be derived from this investigation:

1. On the market discipline front, the policy recommendation is that, in their capital structure, large banks should maintain mandatory subordinated debts and debenture securities. Indeed, sub-debt holders, mainly the institutional investors, have more incentives to monitor banks and enhance market discipline in those firms.

2. With respect to ownership structure, the policy proposal is that, shareholders, executives, and bank directors should hold substantial stakes in banks. Larger stock ownership implies that their wealth is now exposed to greater risk commensurate with those debtholders including depositors. With reasonable shareholdings, bank managers are self-disciplined and they may opt to policies that maximise the value of shareholders equity call-put options and avoid those encouraging bank failures.

3. In relation to bank boards, the policy recommendation is in line with the requirements by Sarbanes legislation, NYSE AMEX and NASDAQ governance models. These frameworks emphasise on corporate firms whose boards are largely composed of independent directors. As such, banks' boards should continue with this sprit and their members should be knowledgeable on the operations and overall risk management of banks, and financial markets.

4. In the ongoing debate over bankers' excessive compensation, the policy suggestion is that banks' compensation contract schemes should be designed not only to focus on aligning the interests of managers with those of shareholders. It should also consider the risk-taking factor. The message is that executive compensation structure models need to be both risk-incentive and risk-disincentive based.

5. With regard to prudential regulations, the policy lesson is that to ensure a healthy banking system and responsiveness to adverse externalities from any systematic risk, regulators should extend their supervision to cover liquidity risk rather than focusing solely on capital adequacy and asset choices and restrictions. Together with credible contingency plans, long-term and permanent global institutional framework settings are important and require a joint consensus between the US and affluent economies of the G-20.

6. Concerning the multiple regulatory issue - in common with other sceptics and commentators, the current US multitude of bank regulatory agencies ought to be consolidated to a single fully-fledged regulator. Otherwise, the prevailing legal and regulatory framework has to be reduced from the four-styled federal banking regulatory structure. This may pave the way for less banking confusion and greater openness leading to more efficiency within the regulatory system.

7. Pertaining to Basel II and III frameworks, the policy agenda is that a full adoption and compliance in line with the Basel II agreement cannot be emphasised enough at this juncture. In addition, banks should adjust to looking at the underlying rules and requisites on Basel III, for its implementation.

   Nevertheless, regulatory burdens atmosphere should be avoided so that a conducive banking business environment can exist for average investors – i.e. the recent Wall Street Bank Regulations Act of 2010. The Act is strictly regulations-based and is intended to enhance transparency in lending activities. Admittedly, the Act has come under fire for having omitted the root cause of the recent global financial shock - i.e. Fannie Mae and Freddie Mac. In addition, it is alleged to be a barrier to firms attempting to create employment opportunities. Taken as a whole though, once the proposed policies are in place, a gradually more healthy banking system can be attained.

7.4 Summary of main Findings

The thesis is composed of seven (7) chapters. Chapter 1 introduces the topic. It looks at why corporate governance of bank research is important with respect to risk-taking. It also identifies three main areas that the ensuing analysis sheds light on. Chapter 2 reviews and discusses literature. The chapter surveys four positions of corporate governance - boards, ownership, executive compensation, and market discipline. Chapter 3 presents data sources, construction of variables, and analyses descriptive statistics in the proceeding empirical chapters 4-6. The following sections document major findings in the empirical chapters.

7.4.1 Distance to default, subordinated debt, and market discipline

The purpose of the first empirical study in Chapter 4 is to investigate the extent to which bank fundamentals can explain a market-based distance-to-default metric in the US banking industry. It analyses whether banks that issue subordinated debts and debentures show an increase in the extent to which bank fundamentals predict the likelihood of their default (comparative to their counterparts without subordinated notes and debentures). Moreover, it examines whether banks' charter values transmit further information to market investors which increase the reliability of bank fundamentals to predict default risk. Lastly, it analyses one aspect of government regulation by comparing the default probabilities of banks that are well capitalised compared to undercapitalised ones.

The main findings can be summarised as follows. Firstly, there is some evidence that distance to default predicted by bank-specific risks on sub-debt banks is higher in comparison to banks that had not issued subordinated debt. For sub-debt banks, distance-to-default increases in non-performing loans and leverage ratios, while it decreases in the interaction of reserve loan losses and leverage ratios. These results coincide with the explanation that market discipline through private monitoring increases the information contents of bank risk fundamentals (Flannery and Sorescu, 1996; Gropp et al. 2004; 2006; Akhigbe et al. 2007). Consistent with the theory, the evidence presented confirms the presence of market discipline in sub-debt banks. This is due to efficient market hypothesis in which market prices can efficiently accommodate all available information in one convenient distance to default. Secondly, for banks with higher charter values (i.e., located in Q5), bank risk fundamentals explain a higher share of the variation in distance-to-default. This result is consistent with the arguments in Keeley (1990) that banks with higher

charter values are self disciplined to undertake excessive risk activities. Finally, distance-to-default sensitivity to bank risk fundamentals is higher in undercapitalised banks compared to well-capitalised ones.

7.4.2 Corporate governance and bank risk-taking behaviour

The objective of the second empirical study in Chapter 5 is to investigate the link between corporate governance and bank risk-taking behaviour. More importantly, it examines whether board and ownership control mechanisms explain bank-specific risks: capital adequacy, asset quality and liquidity. The main findings are fourfold. One, managerial ownership significantly reduced the level of bank capital adequacy as well as endangering asset quality portfolio status. That is, during times of economic uncertainty, banks could be vulnerable to adverse outcomes in their credit portfolios. Two, asset risk proxy (non-performing loans ratio) and managerial ownership are positively associated. Theoretically, managers' incentives to undertake risky activities increase proportionally with increases in managerial ownership. More importantly, in stockholder-controlled banks, managers behave in a less risk-averse manner (Saunders et al., 1990; Cebenoyan et al., 1995; Anderson and Fraser, 2000; Lee 2002). A decrease in capital level proportionally decreased asset quality status,

Three, non-performing loans, capital to assets, and liquidity assets ratios are significant and negatively associated with board size. For non-performing loans, larger boards' decisions have an adverse impact on bank credit portfolios status. This perspective might make the argument that there are some board members who might have close ties with corporate borrowers, and the former are involved in authorising the latter's borrowings. Theoretically, this will impair the bank's capital position. For capital adequacy, smaller boards make extreme decisions that have negative repercussions on bank capital. And for liquidity ratio, smaller boards impair bank liquidity creation. Finally, loan losses ratio and z-score indicate risk-taking is pronounced in *ex-ante* and *ex-post* Sarbanes and Regulation A by board size. Generally, these findings provide bank balance sheet risk measures-based evidence that board and ownership are important in influencing bank risk-taking behaviour.

7.4.3 Managerial incentives and risk-taking in banking

The third empirical study, Chapter 6, investigates the link between managerial incentives and bank risk-taking. Specifically, it considers whether the structure of compensation paid to CEOs induces bank risk-taking. To explore this, board structure is controlled. The major findings are four. Firstly, equity return volatility is positively related to both CEOs' stock ownership and stock options. In addition, leverage and stock option are positively related. Together, the findings indicate that CEOs' compensation structure influences risk-taking and aggressive debt policy. However, higher leverage not only escalates agency costs, it also compounds banks' credit portfolio risks via risk-shifting.

Secondly, return volatility and leverage positively and negatively are related to cash-based compensation. The positive relation can be explained as the competing theory that cash compensation can incentivise risk-taking in banks (Noe et al. 1996). There is also a sense of outcry among politicians, taxpayers, academics, regulators and lawmakers over excessive bankers' big pay packages - especially in bonuses. Three, after allowing for board structure, the association between risk and equity-based compensation remains positive. Again, both bank risk and leverage decrease in board size function. Consistent with the moral hazard models, market to book ratio enter risk and leverage regression models negatively. Finally, it is found that executive compensation and board structure are jointly determined with risk and leverage.

Overall, the results support the view that compensation induces banks' managers to undertake risky investment choices and aggressive debt policy. As such, managerial compensation should not only invite maximisation of the firm value for shareholders, but also, ought to take into account the inherently risky element.

7.5 Study Limitations and Agenda for Future Research

7.5.1 Study limitations

I have constructed a data set containing 301 US publicly traded bank holding companies in this investigation and have contributed to the existing literature in four key areas, as discussed in section 7.3. However, this investigation suffers the

following constraints despite its inherent strengths. First, the major problem confronting this analysis is that, theoretically, board and ownership structure, and risk are endogenously determined. Executive compensation, board structure, and risk are also jointly determined. Therefore, it is possible that the simultaneous system of equations misspecification attributed to complexity in identifying relevant dependent and independent variables is high (Agrawal and Knoeber, 1996; Beiner et al., 2006). Secondly, since corporate governance variables are hand-collected and time consuming (Anderson and Lee, 1997) human error is likely in the data set building process. In addition to this, CEO ownership is combination of stock ownership and stock options. As such, separating those required extra attention and was extremely time consuming.

Thirdly, while much research around corporate governance and risk-taking centres on industrial firms, less is known about the influence of corporate governance on bank risk-taking. This makes comparison of results a bit challenging. Admittedly, existing deficient empirical studies keep a close eye on the US banking environment, but the rest of the world is given much less attention. Fourthly, as argued by Cebenoyan et al. (1995) and quoted by Anderson and Fraser (2000), analysing the relationship between ownership and bank risk-taking is an extremely complex task. Equally, in the area of board structure and risk-taking there is no existing approved theory detailing how a board should act (Hermalin and Weisbach, 2003). Because of these factors, it is hard to draw definitive and self-evident conclusions.

7.5.2 Areas for further research

The following are fruitful avenues which could provide scope for future research. One, the effort to investigate risk-taking in banking and corporate governance structures post-global financial crisis is far-reaching. More importantly, this will help to create a sound bank regulatory framework. The market control measures on bank risk-taking are quite timely, given the unprecedented worldwide financial episodes of the 2000s. Two, bank default risk and bank fundamentals revealed in this investigation can be replicated and compared to industrial firm default risks. To what extent default risk exists in industry and also in other markets is not adequately documented to date. Three, interdependence in board and ownership structure, and subordinated debt in addressing bank risk-taking should be examined. Studies by Agrawal and Knoeber (1996) and Beiner et al. (2006)

indicate that optimal use of each control mechanism mitigates agency conflicts. Subordinated debt is a legitimate market discipline tool of Pillar 2 under Basel II. Whether corporate governance structures influence the opaqueness of banking firms' assets is not well known. Nevertheless, interesting areas for future research agendas can be developed from this thesis.

Taken as a whole, the banking sector has been vulnerable to excessive risk-taking from the time of the Great Depression through to the 2007-09 global financial crisis. With this, had sound corporate governance been in force, it can be speculated that the banking and financial sectors' volatilities would have been averted and not have reached such an appalling intensity.

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