The Priority Structure of Bank Regulatory Capital: The Case of Subordinated Debt

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Intellectual Property Statement

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

The aftermath of a crisis often brings reflections on the adequacy of regulatory capital against financial shocks. Accordingly, succeeding regulatory interventions focus on strengthening the resilience of the banking system by improving the quality and quantity of capital, and subordinated debt (sub-debt) remains key to these reforms. Whether, however, the regulatory motive underpins the decision of banks to issue sub-debt is unclear. Moreover, the perceptions of shareholders on the regulatory function of sub-debt are less understood. This thesis attempts to answer these questions by first reviewing other roles of sub-debt then testing if regulation drives its issuance and finally revealing shareholder incentives that weaken its regulatory function.

Contrasting capital requirement motives with other explanations, and accounting for equity issuance, we find that banks issue sub-debt primarily to improve their regulatory capital buffer. While a few non-regulatory factors, related to easier entry conditions to debt market, influence the issuance decision, their economic impact is smaller than the impact of the buffer. By exploring how variations in tail risk and size influence the sub-debt and equity issuance decisions by banks with low buffers, we show that issuance choices do not reflect risk-shifting incentives.

Next, we review shareholders' perceptions of the regulatory value of sub-debt vis-a-vis the risk-shifting and wealth-expropriation incentives associated with senior debt by comparing the reaction of stocks to these security announcements. We find that senior debt incentives are more valuable than the regulatory benefit of sub-debt. Contrary to regulatory expectations, announcement of sub-debt (capital-improving) offers are valueless even when undertaken by risky or less-capitalized banks; rather, senior debt offered by these vulnerable banks generate significant shareholder value. Pursuant to these risk-shifting motives, senior

debt issuers get riskier post-issuance. These findings suggest that the broader debt priority structure harbours perverse incentives that dilute the regulatory effectiveness of sub-debt.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

BHC	Bank Holding Company
BIS	Bank for International Settlements
FDIC	Federal Deposit Insurance Corporation
FDICIA	Federal Deposit Insurance Corporation Improvement Act
Fed	Board of Governors of the Federal Reserve Bank
FFIEC	Federal Financial Institutions Examination Council
ICC	Interagency Coordinating Committee
ISC	Interagency Supervisory Committee
OCC	Office of the Comptroller of Currency
P&A	Purchase and Assumption Transaction
Task Force	Task Force on Supervision
TPS	Trust Preferred Shares
US	United States of America

Chapter 1: Introduction

1.1 Introduction

Banking crises often leave a trail of economic damage and unbearable financial instabilities that economies and financial systems take a long time to recover from. The severity of social costs associated with these crises normally trigger regulatory reforms that aim to prevent the next one as bank regulators usually convene to redefine prudent banking principles. The latest development in this regard is the implementation of the Basel III capital framework, which improves the quality and quantity of regulatory capital. Along these lines, regulators are placing greater emphasis on high quality components of regulatory capital, such as common equity, as credible and sustainable sources of bank capital. Accordingly, the regulatory prominence of sub-debt, and Tier 2 elements in general, is diminished. Nonetheless, sub-debt still contributes between 19% and 25% towards the total capital adequacy of a bank and as such remains a key component as far as the *quantity* of regulatory capital is concerned.[1]

In spite of the overall importance of sub-debt to the capital adequacy of a bank, little is known as to whether banks use this type of debt primarily for regulatory reasons related to capital requirements. Moreover, there is little evidence on how the shareholders perceive the usage of sub-debt as a tool that enhances the financial stability of their institutions as intended by the regulators. In other words, we do not know if the views of shareholders on the role of sub-debt are compatible with the financial stability objectives that allow banks to

[1] Basel III recognizes Tier 2 elements that includes sub-debt up to 2% of risk-weighted assets (RWA). At this level, these elements would contribute up to 25% to the minimum capital adequacy ratio of 8% or 19% in relation to the minimum requirement that includes the capital conservation buffer of 2.5% (see, BIS, 2010; Federal Reserve System, 2013).

issue it to meet the regulatory capital requirements.

The purpose of this thesis is, therefore, to bring the regulatory importance of sub-debt to the fore by establishing if the ongoing recognition of the instrument in bank regulatory capital underlies its issuance. This test is important for a couple of reasons. Primarily, it reflects on the practicality of the continuous regulatory efforts that seek to influence the recapitalization behavior of banks in order to mitigate threats from financial instability. The extant literature is inconclusive in this respect. The early studies conclude that regulation effectively drives the capital structure decisions of banks (Cornett et al., 1998; Cornett and Tehranian, 1994). However, some recent evidence suggest that regulation is of secondary importance in the financial decisions of banks (Dinger and Vallascas, 2016; Krishnan et al., 2010). In fact, the capital structure of banks is arguably driven by similar factors that apply to non-financial firms (Gropp and Heider, 2010; Teixeira et al., 2014). Bearing these differences in mind, this thesis uses sub-debt as an alternative regulatory element to fully inform debates on the effectiveness of regulation on bank capital structure. Noticeably, the prior literature predominantly addresses this topic by focusing on the use of equity or overall bank leverage, which ignores the regulatory aspect of sub-debt.

Secondly, it is critical to ensure that sub-debt serves the regulatory purposes intended. That is, it is insufficient to merely explore the effects of regulation on the sub-debt issuance decision of banks but necessary to ensure that the instrument does not harbour undesirable intentions that threaten financial stability, which it seeks to uphold in the first place. There are concerns that sub-debt exacerbates moral hazard in banking, especially since the removal of credit covenants that would otherwise disqualify the instrument from regulatory capital or when it is used by standalone banks or BHCs (Ashcraft, 2008; Belkhir, 2013). On these grounds, this thesis proceeds to determine who issues sub-debt, and if the risk-shifting motivation, rather than the regulatory motive, underscores the utilization of the instrument

as suggested by the literature.

While the foregoing tests have an important bearing on the use of sub-debt for regulatory purposes, it is also essential to ensure that these functions are not impeded in any way. In the interest of financial stability, shareholders should view the issuance of sub-debt in the same light as regulators, otherwise the regulatory importance of the instrument would be weakened. On this basis, the thesis finally examines the potential distractions to the regulatory effectiveness of sub-debt by evaluating the valuation perceptions of shareholders towards the instrument, especially in the presence of senior debt. This analysis is based on the existing evidence that shareholders use senior debt to shift risk and expropriate the wealth of junior debt holders (Masulis, 1980). In this respect, debt seniority could present valuable opportunities for bank shareholders to shift risk and expropriate subordinated claims, thereby acting against the objectives of capital frameworks that allow sub-debt in regulatory capital. In line with this possibility, the thesis evaluates whether there are any cross-sectional differences in the reaction of shareholders to the announcement of senior debt or sub-debt, particularly for banks that have a legacy of being risky or under-capitalized. The empirical analysis in this regard concludes by examining how these security choice decisions affect the long-term risk behavior of the issuers and if these choices reflect risk-shifting intentions of shareholders mainly relating to the use of senior debt.

1.2 Contributions of the Thesis

The implications of financial instability are enormous as evidenced by the recent global financial crisis. An array of regulatory tools are available to soften the disruptions from these episodes, among them the regulatory capital frameworks. However, what remains is that these measures would only be worthwhile if they are effective in influencing banks to recapitalize and remain sound. Importantly, the application of regulatory capital frameworks should not bear unintended consequences that further exacerbate financial instability nor be

interrupted in a way that could undermine the effectiveness of the capital elements in regards to financial stability. By using sub-debt as a component of these frameworks, this thesis offers an insight into these themes.

The thesis comprises two in-depth empirical chapters that expand the understanding of sub-debt within the regulatory context, thereby complementing the extant literature that is predominantly preoccupied with the disciplinary and the tax implications of the instrument. As an extension, the chapters contribute to the wider literature on the effectiveness of regulation on the behavior of banks and their capital structure decisions. The thesis is also relevant to discussions on the effective role of sub-debt within regulatory capital frameworks. The summary and contributions of the two empirical chapters are discussed in the following sub-sections.

1.2.1 Does Regulation Drive Banks to Issue Subordinated Debt?

Chapter 3 tests the underlying motives behind the issuance of sub-debt. By comparing the regulatory factor (regulatory capital buffer) to the theoretical capital structure factors (collectively, non-regulatory factors) that drive the issuance of junior debt in non-financial firms, the study isolates the effectiveness (or otherwise) of regulation in the sub-debt issuance decision of banks. The underlying argument of this chapter is that the regulatory acceptance of sub-debt should make it appealing to banks with low regulatory capital buffers. The chapter, therefore, builds upon the existing studies on the relevance of regulation in the financial decisions of banks.

Using sub-debt in this debate is critical in some respects. Firstly, it offers a fresh perspective to the current discussions by using another regulatory capital element other than equity. Secondly, it expands the scope of discussions on the use of sub-debt in banking that have so far excluded the default regulatory functions of the instrument. Some notable studies by Covitz et al. (2004) and Hancock and Birchler (2004) offer some thoughts on the effect

of regulation on sub-debt issuance. However, these studies are concerned with the issuance of sub-debt across deposit legislative regimes, which are of little relevance to the recognition of the instrument in regulatory capital. The present study, therefore, offers a comprehensive picture of the regulatory motives behind the use of sub-debt by referring to the capital frameworks that directly regulate its application in banking.

For this analysis, the study uses securities of publicly listed and delisted US banks for the period ranging from 1983 to 2015. The start of the sample period coincides with the implementation and application of the regulatory capital requirement to all banks in the US, while the length of the sample period ensures that the analysis cuts across all regulatory capital regimes, such that, intertemporal variations in the regulatory treatment of sub-debt are fully captured. In addition, the present study is deliberately targeted at the US given the active discussion of sub-debt in this market, let alone the historic tendency, dating as far back as the 1960s, of banks to use sub-debt as part of their capital (Ehlen, 1983).

The results of this chapter suggest that banks use sub-debt for regulatory purposes. Specifically, banks that are close to the regulatory minimum requirement (low regulatory capital buffer) are more likely to issue sub-debt to improve their overall capital adequacy levels. The importance of non-regulatory factors in the sub-debt issuance decision is usually smaller than this regulatory motive. These results also take into account the available opportunity of banks to use equity for the same purposes.

Crucially, the study establishes that the regulatory motives of using sub-debt do not harbour issues of moral hazard. In this case, risky banks are less likely to issue sub-debt. The findings rather point to some ability of the market to ration risky issuers, thereby exerting some degree of market discipline in debt quantities (Park and Peristiani, 1998). Notably, this rationing also applies to large banks in contrary to arguments that the conjectural government guarantees associated with these banks weakens the market discipline upon

them (Acharya et al., 2016; Balasubramnian and Cyree, 2011; 2014).

1.2.2 The Effect of Debt Priority on the Regulatory Role of Subordinated Debt

The second empirical investigation, reported in chapter 4, evaluates how the seniority of securities within the wider capital structure leads to shareholder incentives that interfere with the effective functioning of sub-debt as a regulatory capital element. This chapter is informed by the existing evidence that shareholders constantly seek opportunities to improve their wealth, and such actions are detrimental to the value of other security classes. Debt in general is susceptible to value expropriation by shareholders (Chen and Stock, 2018; Jensen and Meckling, 1976) but junior debt, in particular, is largely devalued when shareholders issue senior debt or debt of equivalent status (Black and Cox, 1976; Masulis, 1980). The analysis in this chapter, therefore, seeks to assess the extent to which shareholders value the risk-shifting and wealth-expropriation opportunities associated with the use of senior debt at the expense of the regulatory capital efforts that allow banks to use junior debt (sub-debt in this case) as a source of financial strength.

Through an understanding of the shareholder motives in this respect, the thesis contributes to existing studies that consider the current capital frameworks inadequate to control the risk-taking behavior of banks (Admati and Hellwig, 2013; Hellwig, 2010). Specifically, the analysis adds to the outstanding debate that mainly view the inclusion of sub-debt in regulatory capital as unwarranted and detrimental to financial stability (Davies, 2015; Schoenmaker, 2015).

The results from this chapter suggest that the priority of debt within the wider bank capital structure bears moral hazard that weaken the regulatory effectiveness of sub-debt. By reviewing the wealth effects of shareholders when they announce senior or sub-debt, we show that sub-debt does not generate any shareholder value, even for risky or less-capitalized

banks that are supposed to benefit greatly from a regulatory capital element. Instead, senior debt adds significant shareholder value for these risky, less-capitalized or large banks. The tests from a multivariate setting further indicate that the level of risk positively explains the share valuations for banks announcing senior debt but this is not the case for sub-debt offers. These findings are, therefore, in line with suggestions that senior debt provides shareholders with valuable opportunities for shifting risk and expropriating the wealth of other stakeholders (Tang and Singer, 1993).

Bearing in mind these opportunities for risk-shifting, the study proceeds to test how the security issuances profiles the long-term risk behavior of banks. For this test, the analysis compares the 2-year post issuance risk of banks that use senior or sub-debt. We conduct the study over the sample period covering 1984 to 2013 to ensure that security issuers have the minimum required information for the post-issuance analysis. The study shows that the issuance of senior debt aggravates the risk-taking behavior of banks, especially when these banks have a legacy of being risky. However, these effects are not evident in banks that issue sub-debt.

Overall, the findings indicate that shareholders systematically place greater value on the issuance of senior instruments that promote their risk-shifting and wealth-expropriation motives at the detriment of the regulatory value of sub-debt as enshrined in the capital frameworks. As such, the regulatory deficiencies of sub-debt that are identified by the literature are not a result of its design, but are driven by the conflicting shareholder incentives within the broader priority structure of bank capital. In so doing, these findings underscore the widening divergence of the market and regulatory expectations with regards to the use of regulatory capital elements (Lubberink and Willett, 2016). Moreover, it extends studies such as Hancock and Birchler (2004) that evaluates the complementary nature of sub-debt and senior debt within the bank capital structure without regard to the implications of the

underlying tensions from their coexistence.

1.2.3 Structure of the Thesis

The remainder of the thesis is organised as follows. Chapter 2 reviews the roles of sub-debt within the wider bank capital structure. These functions range from the regulatory role to the disciplinary, informational and tax benefits offered by the instrument. Chapter 3 investigates the effect of regulation on bank's decision to issue sub-debt. The chapter further evaluates whether these regulatory motives conceal the risk-shifting motives of banks. Chapter 4 reviews the implications of debt seniority on the regulatory effectiveness of sub-debt, where the study scrutinizes the motives of shareholders that use senior debt in the presence of sub-debt. The chapter basically explores the shareholder perspectives with regard to the value of moral hazard opportunities provided by senior debt vis-a-vis the regulatory value of sub-debt. Additionally, the chapter assesses the impact of security choice decisions on the long-term risk behavior of banks with a view to determining whether the choice to issue senior debt underpins shareholders' risk-shifting intentions. Finally, Chapter 5 concludes the thesis, offers some policy implications and identifies areas for future research.

Chapter 2: The Role of Subordinated Debt in Banking

2.1 Introduction

The significant role of banks in the financial sector indicates that major disruptions to their functions would cause severe consequences for economic growth (Dell'Ariccia et al., 2008; Fernández et al., 2013; Reinhart and Rogoff, 2008). For this reason, strengthening the financial stability of banks continues to be a key mandate of bank regulators (BIS, 1988; 2010).

Among the financial stability tools at their disposal, regulators are armed with regulatory capital frameworks that define unencumbered instruments that would unconditionally support institutions during distress to avert any disruptions to the smooth functioning of the banking system. This active determination of the components of regulatory capital and the setting of minimum capital requirements, thereof, act as an element of assurance on the safety and soundness of banks (Berger et al., 1995). In this manner, bank capital requirements are viewed as an incentive tool that aligns regulatory concerns about the social costs of financial instability to the private interests of bank shareholders (Miles et al., 2013; Santomero and Watson, 1977; Tarullo, 2008).

However, the enormous task of financial stability cannot be sorely entrusted to shareholders. Hence regulators have expanded the scope of capital elements beyond the traditional forms of capital i.e., common or preference shares as is the case in non-financial firms. In this respect, regulators have enlisted unconventional means of capital, among them sub-debt, to strengthen the financial capacity of banks. The inclusion of sub-debt as a regulatory capital element is, however, subject to stringent regulatory qualification that specifically requires the instrument to be long-term, unsecured, uninsured or subordinate to depositors and general creditors, among others (Federal Reserve System, 1985a; 1989; 2013).

Regulators are convinced that these conditions provide sufficient compromise for sub-debt to act as a cushion for depositors and general creditors despite its transience and incapacity to absorb losses on an ongoing basis.[2] Effectively, the residual loss position of sub-debt holders is akin to that of the deposit insurer, prompting views that its holders bear similar interests as regulators in so far as the safety and soundness of banks is concerned (Berger et al., 1995; Tarullo, 2008).

In spite of these obvious regulatory benefits, little is known on whether banks use sub-debt for the primary purpose of satisfying the capital requirements, neither is there evidence on the deterrents to the regulatory function of sub-debt. The instrument has rather received a lot of attention in other aspects of the capital structure than its default regulatory role. A more prominent and widely researched role of sub-debt is its ability to deter moral hazard in banking due to the risk-sensitivity of sub-debt investors (see among others, Chen and Hasan, 2011; Evanoff et al., 2011; Nguyen, 2013; Zhang et al., 2014). Other, auxiliary roles of sub-debt are with regard to its information content (Covitz and Harrison, 2004; Hancock and Birchler, 2004) and its existence as an alternative security that banks can apply in their financial decisions, more especially for tax purposes (De Mooij and Keen, 2016; Schandlbauer, 2014; 2017).

This chapter further elaborates on these functions in the following sub-sections. After introducing the importance of regulatory capital in financial stability, sub-section 2.2 explains the regulatory role of sub-debt by first considering the history of the regulatory capital

[2] The recognition of these deficiencies forms the basis for relegating the regulatory role of a sub-debt to a supplementary one, and justifies its historically restricted contribution in regulatory capital to 50% of Tier 1 elements (BIS, 1988; Federal Reserve System, 1985a; 1989). At the same time, this restriction could be underpinning the scarce utilization of the instrument in banks (Bennett et al., 2015; Conlon and Cotter, 2014) and its concentration among a few large banks (Belkhir, 2013; BIS, 2003; Kwast et al., 1999).

standards in the US. The sub-section then offers some insights on the conditions that have overtime allowed sub-debt to be used as a form of bank regulatory capital. Sub-section 2.3 summarizes the debates on the market discipline from sub-debt, starting off with the monitoring roles then proceeding with the influencing effects of the instrument. This sub-section further deliberates on the mandatory sub-debt proposals that attempt to complement the supervisory processes by requiring banks to issue sub-debt. The informational, tax and capital structure roles of sub-debt are elaborated in sub-section 2.4. Lastly, sub-section 2.5 concludes the debates on the roles of sub-debt by identifying some outstanding gaps that this thesis attempts to fill.

2.2 The Role of Sub-Debt in Regulatory Capital

In the US, the International Lending and Supervision Act of 1983 pushed regulators to formally require banks to maintain a mandatory capital adequacy ratio following concerns of systemic instability from the debt crisis that engulfed developing countries (FDIC, 1997). Prior to this development, regulators did not have an explicit framework for assessing bank capital adequacy but relied on peer-review assessments to gauge the safety and soundness of individual banks. Notably, the discussions on the form and definition of bank capital far preceded this legislation as regulatory intentions towards a more formal and explicit capital adequacy framework were established by the Interagency Supervisory Committee (ISC) in early 1978 (FFIEC, 1979).[3] In fact, FFIEC (1979) indicates that deliberations on the overall capital adequacy of banks were an afterthought of a process that started in August 3, 1978 to specifically review the purpose of sub-debt in bank capital. Nonetheless, subsequent

[3] The ISC was formed in 1977 under Interagency Coordination Committee (ICC), a body created by the three core banking regulators in the US viz., Federal Reserve Board, Federal Deposit Insurance Corporation and Office of the Comptroller of Currency to improve the supervisory process of financial institutions under their purview (FFIEC, 1979). The mandate of the ISC was subsequently assumed by the Task Force on Supervision following the establishment of the FFIEC in 1979.

proposals by the FFIEC to include sub-debt as part of the definitions of regulatory capital brought some grave divisions among the regulatory agencies (Battey, 1981).

The capital rules proposed by FFIEC (1981) categorized bank capital into two tiers, primary and secondary, of which sub-debt would constitute the latter on condition that it meets a minimum original (weighted-average) maturity of 10 years (7 years) and restricted to 50% of primary capital. While the Office of the Comptroller of Currency (OCC) and the Federal Reserve Board (Fed) agreed that sub-debt offers some protection to depositors and general creditors, the Federal Deposit Insurance Corporation (FDIC) strongly held equity as the only critical determinant of bank capital (FDIC, 1981; 1997). In more precise terms, the FDIC capital adequacy ratio was exclusively equity divided by total assets, both adjusted for loss and doubtful assets, while sub-debt and limited-life preferred stock were explicitly disregarded as sustainable sources of bank capital given their lack of permanence, inability to absorb losses on an on-going basis, and mandatory debt servicing requirement that aggravated an institution's financial condition (FDIC, 1981). The disparity of views on this matter are the cause of the subsequent parallel and disjointed application of capital rules in the early 80s.[4] However, the rules were ultimately harmonized in 1985 as the agencies found common ground on the definition of capital and the capital adequacy ratio (Federal Reserve System, 1985a). Thereafter, sub-debt became a key component of regulatory capital across all regulatory capital regimes. Save for the reduction of the minimum maturity from 7 years (pre-Basel I) to 5 years post-Basel I, the conditions for recognizing the instrument in

[4] From 1981 the 3 agencies set their own capital adequacy ratios although the Fed and OCC rules were largely consistent and determined on the basis of bank-size. The Fed and OCC required a total capital adequacy ratio of 6% for banks with assets below $1billion (Community Banks); 5.5% for those with assets below $15billion (Regional Banks), while the 17 multinational banks with assets greater than $15 billion were initially excluded from the requirements (Federal Reserve System, 1982). The FDIC on the other hand set an across the board minimum requirement of 6% for state non-member banks (FDIC, 1981).

regulatory capital are relatively similar (Federal Reserve System, 1985a; 1989; 2007; 2013). Table 2-1 summarizes the regulatory criteria for recognizing sub-debt within bank capital across the regulatory capital frameworks in the US.

[Insert Table 2-1]

In spite of the strict conditions that ensures that sub-debt is sufficiently stabilized to support a bank's financial condition, commentators still argue that the capital frameworks that continue to recognize the instrument in regulatory capital are inadequate and flawed (see, Barrell et al., 2011). These concerns extend far beyond the usual transiency and going-concern limitations of the instrument as the present discussions by Davies (2015) and Schoenmaker (2015), for example, rule out chances of the instrument ever being exposed to liquidation losses due to rescue packages that often protect banks from failure. On these grounds, the instrument is deemed irrelevant in regulatory capital and as such the capital frameworks that continue to recognize it are misguided and ineffective (Fullenkamp and Rochon, 2017).

Notwithstanding that, a key omission in the debates on the inefficacy of sub-debt in regulatory capital is the potential conflict of shareholder incentives brought about by the priority of debt within the broader bank capital structure, which could incite banks to use senior instruments to expropriate junior debt (Black and Cox, 1976; Smith and Warner, 1979). In essence, the continuous regulatory emphasis of sub-debt as an important element in the financial stability of banks could merely be frustrated by risk-shifting and wealth-expropriation incentives that cause banks to use senior, but non-regulatory elements, even when the regulatory benefits of using sub-debt would be superior. This thesis further elaborates on this possibility in the fourth chapter.

2.3 The Role of Sub-Debt in Market Discipline

The most acknowledged role of sub-debt outside the regulatory capital sphere is its presumptive ability to constrain risk-taking in banks. The residual nature of sub-debt usually leads to holders being alert and motivated to evaluate the risk positions of a bank in an effort to avert prospective losses upon bankruptcy. Interestingly, this secondary role of sub-debt was promoted by the regulators during discussions that built up to the Basel I reforms, as the FDIC made proposals for a capital adequacy ratio of 9%, of which one third would be contributed by sub-debt (Federal Reserve System, 1985b). Although these proposals were never adopted, the FDIC was being unusually receptive to the inclusion of sub-debt in regulatory capital in order to supplement supervisory efforts with enhanced market discipline from the instrument. The regulators were adamant that sophisticated sub-debt investors are able to gather information about the financial health of an institution and appropriately incorporate these assessments in the pricing of their subordinated funds. The resultantly high borrowing costs for risky institutions would increase the cost of meeting the capital requirements with sub-debt, and this threat could act as an effective deterrent to excessive risk-taking (Federal Reserve System, 1985b). This regulatory position opened an active debate on whether the market is able to discipline banks through liabilities such as sub-debt.

To start with, an effective market discipline regime would be sustained when investors continually gather and process publicly available information about institutions and timely reflect these evaluations in the prices of the securities they hold (Bliss and Flannery, 2002). Crucially, this exercise should not be burdensome on investors and the managers should be acting in the best interests of security holders, otherwise the information signal extracted from the security prices would be distorted. Bliss and Flannery (2002) also makes an important distinction with respect to the phases of market discipline. Firstly, the generation of the information signal through constant changes in security prices is just an indication of

market monitoring, while the ability of this signal to alter the actions of managers/institutions exhibits some elements of market influence (also see, Bliss, 2001; Flannery, 2001). Notably, the discussions that reacted to the FDIC's proposals i.e., Hannan and Hanweck (1988), Avery et al. (1988) and Gorton and Santomero (1990), and the majority of the literature in general, are concerned with the monitoring phase of market discipline.

2.3.1 The Monitoring Role of Sub-Debt

In some of the earliest work in this area, Hannan and Hanweck (1988) examines the association between interest rates on uninsured certificates of deposit (CD) and bank solvency risk. Using a sample of 300 US banks over the first quarter of 1985, their study finds that CD investors accordingly demand a yield that appropriately compensates their perceived default risk. While the study demonstrates the applicability of market discipline in banking, using CDs, however, misses the specific discussion on the effectiveness of sub-debt as a dual-purpose instrument with regulatory and disciplinary roles. In fact, Avery et al. (1988) argues that market discipline through uninsured depositors is less appealing given their ability to quickly readjust their exposure positions in response to bank problems or be bailed out under a purchase and assumption (P&A) arrangement. Sub-debt is constrained in these two aspects due to its relatively long-term nature and the lack of protection under a P&A transaction. In this regard, Avery et al. (1988) tests the relationship between sub-debt spreads and bank risk to establish the compatibility of market and regulatory interests in as far as the use of sub-debt is concerned. Over the 1-year period (1983-1984), the study finds that bank risk is not reflected in the credit spreads of sub-debt issues made by the largest US Bank Holding Companies (BHCs), hence the instrument would not offer supplementary benefits envisioned by the regulators.

Effectively, earlier views on the applicability of market discipline in banking are divergent and Gorton and Santomero (1990) attributes the disparity to model deficiencies that are

unable to precisely explain the relationship between bank risk and the price of debt. In their case, the default risk premium of junior debt should take into account the assumed risk positions of the instrument as firm value changes. In the presence of senior debt, junior debt holders behave like equity when firm value is critically low (see, Black and Cox, 1976). As the residual value accrues to senior debt under these circumstances, junior debt will be relegated to a similar residual position as equity, thereby benefiting from increased risk. However, excessive risk is detrimental to junior debt when firms are valuable. Effectively, the value of sub-debt is not a linear function of risk as assumed by the prior studies on market discipline, and Gorton and Santomero (1990) addresses this problem by calculating the volatility implied by sub-debt prices. With their supposedly accurate measure of debt value, Gorton and Santomero (1990) finds that bank risk is not reflected in the pricing of sub-debt as previously found by Avery et al. (1988).[5]

2.3.1.1 The Effect of Government Guarantees on Market Monitoring - The US Perspective

A common factor among the earlier studies, however, is their concentration around a period that experienced market turmoil that prompted the government to assemble rescue packages in order to allay fears of contagion and systemic risk. A significant rescue policy around the early 80's is the explicit guarantee on systemically large banks that were deemed "Too-Big-To-Fail" (TBTF). The greatest beneficiary of the TBTF policy was Continental Illinois National Bank and Trust Company (CINB), the 7th largest bank then, where all its depositors and general creditors were guaranteed upon its failure in May 1984 (see, FDIC, 1997). Controversially, the regulators offered an unprecedented level of capital and liquidity support in a bid to save CINB, a development that created a general impression that no

[5] The test is applied to the same sample and study period as in Avery et al. (1988).

investor funds would be lost through a bank failure (Flannery and Sorescu, 1996). Essentially, the specific timing of the earlier studies that do not find any reaction of sub-debt spreads to bank risk would be tainted by the presumptive protection of creditors, including sub-debt investors. Flannery and Sorescu (1996), therefore, argues that it is imperative that the tests for market discipline should reflect the time-varying risk perceptions of investors associated with policy changes. These perceptions were certainly attenuated by the TBTF policy, but were subsequently revamped by the late 80s P&A policy that sought to impose losses on uninsured creditors and the bank holding companies of failed bank subsidiaries. Beyond the P&A period (post 1988), investors would have fully absorbed the reality of potential losses to their positions, especially with the discussion and implementation of stricter regulatory measures under the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA).

Using a larger sample size that covers the significant policy changes of the 80s (1983 to 1991), Flannery and Sorescu (1996) finds that sub-debt spreads around the early periods associated with TBTF presumptions are less reactive to bank risk, while the spreads seem to account for the risk profiles of banks over the whole study period, more specifically in the latter 3 years of the study (1989-1991). In this regard, state guarantees that insulate creditors against failure encourages them to be passive to the risk-taking behavior of banks. Basically, the results of the prior studies are driven by the implied protection from the TBTF policy that weaken the sensitivity of sub-debt investors to bank risk. These views are generally shared by the studies of Covitz et al. (2004) and Hancock and Birchler (2004) that track the risk-perceptions of sub-debt investors across deposit insurance regimes. Using a sample of sub-debt issues made by the largest US BHCs over the period 1985 to 2002, the twin studies find that the instrument is an effective discipliner and more interestingly, sub-debt spreads

have always been sensitive to bank risk but the monitoring signals are suppressed under econometric analysis that do not control for sample selection bias.

More recent evidence by Balasubramnian and Cyree (2011) also shows that the state bail-out of the Long Term Capital Management (LTCM) impaired market discipline from sub-debt. The study establishes that yields of the 300 sub-debt issues made by 70 US BHCs between 1994 and 1999 did not capture the fundamental risk of banks after LTCM. From another perspective, the recent implementation of the legislation that seeks to remove government rescues, in terms of the Dodd-Frank Act of 2010, drove sub-debt investors to appropriately price their exposures in large US BHCs (Balasubramnian and Cyree, 2014). In effect, a legislation that limits the chances of bail-outs increases the yield spreads and as a result reduces the funding advantage of large banks that issue sub-debt, thereby enhancing market discipline in banks that would otherwise be deemed TBTF. Generally, the extant literature is adamant that the market for sub-debt offers disciplinary properties that can supplement supervisory efforts provided there are no state interventions (also see, Ashcraft, 2008; Belkhir, 2013; Chen and Hasan, 2011; Flannery, 1998).

2.3.1.2 The Effect of Government Guarantees on Market Monitoring - The International Perspective

Evidence shows that the diluting effect of government guarantees on the market monitoring abilities of sub-debt is not driven by geopolitical issues specific to the US market. Using an international sample, Nier and Baumann (2006) finds that, with limited government support, banks that hold a larger fraction of sub-debt have higher levels of capital in line with suggestions that market discipline drives banks to be safer. Another cross-country study by Nguyen (2013) also finds that higher levels of sub-debt in bank capital structure mitigate risk-taking, except for large banks deemed TBTF or in government controlled institutions. Similar effects are noted by Sironi (2003) in a European context, where sub-debt investors

can effectively reflect the risk profile of banks within their valuations on condition that the banks are not subject to government subsidies through guarantees or public ownership. The study further emphasizes that the waning perceptions of governments bailing out large institutions due to tighter public sector budgets and the cession of national bank's monetary policy decisions to a single central authority are also instrumental to the noticeable participation of European sub-debt investors in monitoring bank risk. Similarly, the deliberate act by the Japanese government to let Hokkaido Takushoku Bank fail removed the bail-out perceptions associated with large Japanese banks, and decisively drove investors to fully reflect the eminent probability of default on their sub-debt valuations (Imai, 2007).

However, the monitoring effects of sub-debt are not only disturbed by these state guarantees, but contradictory regulatory efforts that allow more junior securities in bank capital also hinders these market forces. For instance, Balasubramnian and Cyree (2011) shows that sub-debt yields are not sensitive to bank risk following the introduction of Trust Preferred Shares (TPS), a more junior regulatory capital element. Basically, the capital priority restructuring that came along with TPS elevated sub-debt to a "senior" status, hence investors became passive to bank risk.[6]

2.3.2 The Influencing Role of Sub-Debt

Another stream of literature in this respect considers the less developed phase of market discipline in regards to the ability of sub-debt to influence the behavior of banks. As Bliss (2001) indicates, the adjustment of security prices only tells the story from a market monitoring perspective, but a complete effect of market discipline would be attained where the actions of managers are altered by this security repricing.

[6] Boyson et al. (2016) offers a detailed discussion of the regulatory importance of TPS. The securities were ultimately derecognised in regulatory capital in September 2010.

By examining security returns of 107 BHCs over the period 1986 to 1997, Bliss and Flannery (2002) demonstrate that sub-debt returns, and equity returns alike, are not consistently associated with subsequent managerial actions. Similar evidence is provided by Krishnan et al. (2005) as they show that the issuance of sub-debt does not result in changes in the risk-behavior of banks. Based on a matched sample of 28 banks for the period 1994 to 1999, the study concludes that sub-debt lacks some preventative influence as the risk variables are not sensitive to its first issuance. While the findings by Krishnan et al. (2005) could be swayed by the limited sample size, Niu (2008b) also suggests that markets could have already adjusted their valuations in the period leading to the issuance, given the tendency of banks to lower their pre-issuance risk in an attempt to attract favorable funding rates in future. The study further argues that, in the aftermath of sub-debt issuance, banks would have little chance to alter their risk profiles as the disciplining effect of sub-debt sets in. Therefore, the dynamics underlying the pre-issuance risk behavior would be important into the post-issuance era, resulting in no changes in risk across the two periods (Niu, 2008b, p.1116).

Apart from the lack of market influence, there is some emerging evidence that sub-debt, and junior debt in general, is ineffective as a source of market discipline. Blum (2002) argues that risky debt pushes banks to seek higher yields to maintain sufficient margins above their cost of borrowing. In this case, banks will always be chasing risky and high-yielding assets in a bid to offset the high cost of funding with sub-debt. In effect, any pre-issuance efforts by investors to accurately factor in the risk profile of a bank in their sub-debt valuations are counteracted by excessive risk-taking after issuance. Therefore, capital structures that include sub-debt would be ineffective in curbing risk if banks cannot commit to a predetermined risk level. Niu (2008a), however, demonstrates that such commitment can be achieved through deposit rates. Under sufficiently competitive markets, banks that attract an above

average deposit rate imply that they are more likely to invest in high-yielding and risky assets to offset their deposit contracting costs. That is, the gambling incentives of these banks are high, and sub-debt investors that are able to set anticipatory prices in tandem with this probable behavior can effectively reduce the funds available for future gambling. In essence, the level of deposit serves as the necessary commitment device required by Blum (2002) and banks that offer a prudent deposit rate would be more likely to invest in a safe asset. Niu (2008a), therefore, concludes that the disciplinary effect of sub-debt can be fully achieved under these terms but on condition that the levels of sub-debt in bank capital is maintained in limited quantities. They argue that high levels of debt would make default more valuable, thus countering the effects of market discipline.

Other studies find a conditional effect of sub-debt on the risk behavior of banks. For example, Ashcraft (2008) and Belkhir (2013) find that sub-debt has a risk-mitigating effect on subsidiaries of BHCs. The studies argue that the disciplinary effect of sub-debt is aided by the equity holding of BHCs that provide sufficient control to direct the actions of subsidiaries. On the other hand, sub-debt exacerbates moral hazards and worsens the financial condition of standalone banks or BHCs. Similarly, the introduction of Basel I requirements that removed tighter credit covenants weakened the ability of sub-debt investors to constrain risk-taking in banks (Ashcraft, 2008; Goyal, 2005).[7] Effectively, the regulatory criteria that recognize sub-debt in regulatory capital stand against the market forces that are intended to complement the supervisory processes.

In the midst of the conflicting evidence on the disciplinary role of sub-debt, Park (2000) contends that the monitoring roles cannot be delegated to a junior debt holder in the first

[7] Following the introduction of Basel I, regulatory sub-debt ceased to have credit-acceleration and credit-enhancement features to prevent creditors from "running" on financially distressed banks (Federal Reserve System, 1989).

place. In their view, senior debt provides effective discipline since risky bets impair their face value, which would otherwise be paid in full upon liquidation. In this case, senior lenders are highly sensitive to adverse information and would always opt for liquidation while the residual nature of junior debt means that they would derive little value from liquidation, but, would rather choose to continue the operations regardless of the risks faced. Notably, this monitoring regime would be effective if the impaired position of the senior lender is maintained at marginal amounts, otherwise the incentives to liquidate would be lost. More importantly, the debt structure of firms should ensure that only a single security holder is prioritized and appropriately rewarded for their monitoring role or else the free-rider problems would create a monitoring gap that firms could exploit to advance their risk-taking activities.

2.3.3 Mandatory Sub-Debt Proposals

The foregoing evidence points to a disparity of views with regard to the oversight function of sub-debt and junior debt in general. Notwithstanding that, the risk monitoring role of sub-debt still gained greater prominence such that these disciplinary properties are considered potential complements to the supervisory processes (Tarullo, 2008). However, these disciplinary effects would only accrue to banks that choose to issue the instrument. That is, the prospect of higher sub-debt costs resulting from greater risk and the subsequent regulatory inference of distress from the inability of banks to raise additional funding can only be determined for banks that choose to issue sub-debt. Due to this discretionary issuance, a large volume of the literature emphasizes that the desirable elements of sub-debt can properly be harnessed if regulators impose a minimum mandatory sub-debt (MSD) requirement (see for example, Evanoff et al., 2011; Hamalainen et al., 2010; Niu, 2008b; Tarullo, 2008). In this instance, banks will be required to always hold some proportion of sub-debt within their regulatory capital. The early discussions on the design of an effective

MSD policy are summarized in Lang and Robertson (2002) and BIS (2003) and the proposals generally anchor on the magnitude and frequency of sub-debt issuance. In terms of magnitude, a popular suggestion is that an optimal MSD policy should require banks to hold about 2% of risk-weighted assets in sub-debt (Calomiris, 1997; 1999; Evanoff and Wall, 2001; Herring, 2004; U.S. Shadow Financial Regulatory Committee, 2000). This level would ensure that the requirement is not burdensome on banks (Lang and Robertson, 2002) and constraining sub-debt to a small upper bound would, in general, reduce the gambling incentives of banks (Niu, 2008a). Otherwise, a larger repayment commitment associated with higher levels of debt would contravene the disciplinary effect of sub-debt as banks would rather value expected payoff of going bankrupt (Niu, 2008a, p.46). In general, larger debt holdings entrench investors, thereby offering similar potential upside gains from increased risk-taking as an equity stake (Park, 2000).

With regard to frequency, there is some consensus that regular issuance would greatly enhance the quality of the signal from sub-debt. This will arise from the constant adjustment of debt valuations that reflect new information about the condition of the bank (Hamalainen et al., 2010; Kwast et al., 1999; Litan and Rauch, 1997). Effectively, the debt markets would offer a timely assessment of the bank risk profiles if sub-debt is issued at high periodic intervals, preferably every year (Evanoff et al., 2011; Evanoff and Wall, 2001). Moreover, Evanoff et al. (2011) argue that the frequent roll-over of sub-debt would further develop the liquidity and depth of the debt markets with an ultimate reduction in the issuance costs.

To that effect, the US Congress directed regulators through the Graham-Leach and Bliley Act (GLB) also known as the Financial Modernization Act of 1999 (Section 108), to assess the viability of requiring large banks to hold some level of sub-debt in their capital. The report in this regard points to similar views that the market for sub-debt provides useful signals, especially for large banks whose issues appear in line with most aspects of the MSD

proposals (see, Federal Reserve System and Treasury, 2000). However, there are some significant considerations that still need to be made prior to mandating sub-debt issuance. Specifically, the Federal Reserve System and Treasury (2000) is of the view that the current evidence does not rigorously demonstrate that sub-debt spreads exclusively and accurately capture the risk perceptions of investors. This skepticism is supported by evidence that sophisticated and informed investors are willing to assume positions in sub-debt, so long as they are enticed by a reasonable premium over an otherwise safer position i.e. senior debt (see, Hancock and Birchler, 2004). Moreover, Levonian (2000) and Gropp et al. (2006) argue that the signals from sub-debt spreads about the health of a bank are not superior to equity, if anything, the indicators from both securities would be effective as complementarities.

Based on these observations, and the overarching need to fully reflect on the cost-benefit of a MSD, the Federal Reserve System and Treasury (2000) is convinced that the regulatory evidence for sub-debt is still at infancy and further research is needed to inform a mandatory sub-debt policy. Crucially, the report argues that the introduction of a MSD might prematurely crowd out several other interventions with similar regulatory intentions viz., FDICIA and the Pillar 3 requirements under Basel II whose effectiveness is yet to be tested. Moreover, enhancing the disciplinary effect of sub-debt through shorter maturities needs to be balanced with the long-term traits of capital-like securities that have to absorb bank losses (Tarullo, 2008). The greatest challenge, therefore, lies in effectively managing the regulatory expectations with the disciplinary prospects of sub-debt, lest the instrument loses its relevance as a capital-cushion in favor of its role as a mere signaling device.

2.4 Sub-Debt and Bank Financial Decisions

Banks also use sub-debt in other aspects of their operations, but the most common ways are to disclose private information (Covitz and Harrison, 2004; Hancock and Birchler, 2004) and to benefit from the tax shield associated with debt (Schandlbauer, 2017). With regard to

its information content, Covitz and Harrison (2004) finds that banks use sub-debt to release positive private information to the market. In their arguments, the quality of information disclosed through the issuance exercise is fundamental to the funding costs of an institution. Accordingly, the only banks that would undergo the debt issuance process are those with favorable information and credit-sensitive securities like sub-debt are used as conduits for divulging this positive private information to the debt markets. By examining the credit rating migrations (ratings downgrades and upgrades) of 136 BHCs between 1990 and 1998, Covitz and Harrison (2004) show sub-debt issuers are more likely to receive a rating upgrade in line with this positive information hypothesis.

Apart from releasing information, sub-debt is also used to serve the differing investors' unobservable risk-preferences that are based on the level of their knowledge. Hancock and Birchler (2004) indicate that sub-debt is willingly held by investors that are well informed about a bank's default risk probability and are accordingly incentivized for bearing the additional risk associated with the instrument. On this basis, sub-debt is always priced in relation to the safer securities like senior debt, hence the premium on sub-debt also reflects the compensation for holding it (the incentive premium). Precisely, "… the incentive premium can be thought of as information rent earned by investors who have favorable information about the issuer" (Hancock and Birchler, 2004, p.3). On this premise, sub-debt is mainly used when economic conditions are favorable and the market generally have good information about issuers, otherwise senior debt would be offered.

Banks also use sub-debt to earn the tax benefit that comes with the tax-deductibility of interests repayments on debt. While bank leverage generally rises with tax increases (De Mooij and Keen, 2016), the ability to extract the tax benefit through sub-debt, however, depends on the state of bank-capitalization. Schandlbauer (2017) finds that poorly capitalized banks gain the dual tax and regulatory advantage by shifting their liabilities away from non-

tax-deductible mezzanine debt to sub-debt. Nonetheless, the implications of these adjustments are negligible when compared to the overall leverage adjustments made by well-capitalized banks.

Other than the fore mentioned functions, Schandlbauer (2014) depicts sub-debt as an alternative security that banks can apply in their capital structure decisions. In the setting where banks are supposed to adjust towards their target leverage and Tier 1 ratios, Schandlbauer (2014) finds that banks further deviate from their targets by issuing sub-debt. Accordingly, the extent of Tier 1 or leverage ratios are irrelevant to the decision of banks to issue sub-debt, rather, banks appear to use the instrument for other purposes that could range from tax benefits, signalling of financial strength or for its contribution to total regulatory capital. Essentially, Schandlbauer (2014) is limited in explaining the precise forces underlying the issuance of sub-debt by banks. Moreover, sub-debt does not contribute to either of the primary capital ratios used in the analysis, therefore the study greatly undermines the regulatory relevance of the instrument. Furthermore, combining banks, mutuals and thrifts in the same analysis complicates this discussion as these institutions are differently affected by regulation. In addition, the limited study period of 2000 to 2007 inadequately captures the intertemporal variations on the treatment of sub-debt in regulatory capital.

2.5 Conclusions

The existence of sub-debt within bank capital structure is traceable to many factors. However, the common purpose of the instrument is largely explained by its ability to provide market discipline that reduces excessive risk taking in banking. In some other ways, albeit less common, sub-debt appears to be used as an information signal, where its issuance acts as a channel to release positive private information to the market. Also, the instrument appears to offer some tax advantages over and above its existence as an alternative capital element. Effectively, the functions of sub-debt in bank capital are not limited to a single

dominant effect. Notwithstanding that, the extant literature on the role of sub-debt completely side-lines the possible regulatory functions of the instrument in spite of its continued recognition as an element of regulatory capital. That is, banks could be using sub-debt as a means of improving their overall regulatory capital position.

In recognition of this gap, and the general debate on the irrelevance of regulation on the capital structure of banks, this thesis attempts to explain the role of regulation on the decision of banks to issue sub-debt. The thesis considers the impact of the deviation from the total capital adequacy ratio (with sub-debt as a constituent) on the sub-debt issuance decision of banks across all regulatory capital frameworks in the history of the US banking sector. In further tests, the thesis examines the effect of shareholder incentives arising from the priority of debt within the broader capital structure of a bank on the ability of sub-debt to effectively discharge its regulatory role. These tests are mainly concerned with the manner in which shareholders perceive the announcement of a regulatory capital element (sub-debt) and senior debt - a security that is renowned for supporting shareholder motives that seek to shift risk and expropriate the wealth of junior debt securities.

In this regard, the empirical chapters follow up with chapter 3 studying the effect of regulation in the sub-debt issuance decision of banks, while chapter 4 draws conclusions on how the seniority of debt within the wider bank capital structure weakens the effective functioning of sub-debt in regulatory capital.

Tables - Chapter 2

Table 2-1: Conditions for the Recognition of Sub-Debt in Bank Regulatory Capital

This table summarizes the criteria for the inclusion of sub-debt in bank regulatory capital across the capital frameworks in the US. Pre-Basel I Regime is the regulatory period before 1990 while Basel I Regime is the period from 1990 to 2007. Basel II is the period from 2008 to 2013 while the Basel III is the period after 2014.[8]

Condition	**Pre-Basel I Regime**	**Basel I Regime**	**Basel II Regime**	**Basel III Regime**
Regulatory quota	50% of Tier 1 Capital or up to 0.5% of Total Assets with other Tier 2 elements	50% of Tier 1 Capital or up to 4% of RWA with other Tier 2 elements	50% of Tier 1 Capital or up to 4% of RWA with other Tier 2 elements	Up to 2% of RWA with other Tier 2 elements
Minimum original average maturity	7 years	5 years	5 years	5 years
Level of subordination	Depositors	Depositors and general creditors	Depositors and general creditors	Depositors and general creditors
Be unsecured/ unguaranteed/uninsured and not a deposit	Yes	Yes	Yes	Yes
Have credit-sensitive or payment-acceleration features	Not applicable*	No	No	No
Seek prior regulatory approval before redemption	Yes	Yes	Yes	Yes

* The capital framework is not explicit in terms of these features, which could be viewed as a non-restriction for investors that wish to apply credit-linked covenants.

[8] The regulatory periods are defined in line with the effective implementation dates (including transition periods) of the capital frameworks in the US (see, Federal Reserve System, 1985a; 1989; 2007; 2013).

Chapter 3: Does Regulation Drive Banks to Issue Subordinated Debt?[9]

3.1 Introduction

The reform of bank capital requirements triggered by the 2007-2009 financial crisis, and embedded in the Basel III Accord, increases the quantity and quality of the regulatory capital required to strengthen the resilience of banks to shocks (BIS, 2010). Despite these regulatory changes, subordinated debt (sub-debt) remains a key component of regulatory capital and the issuance of this type of debt can still help banks comply with capital requirements.[10]

Nevertheless, by giving banks the opportunity to improve their capital requirements via debt, regulators might exacerbate risk-shifting incentives in the banking industry (Admati et al., 2018; Ashcraft, 2008). This is especially the case if market discipline in the sub-debt market is ineffective in penalizing riskier banking firms when they raise funds (Acharya et al., 2016; Gorton and Santomero, 1990; Krishnan et al., 2005).

Whether banks issue sub-debt primarily because of capital regulation and whether the regulatory treatment of sub-debt especially appeals to banks with more risk-shifting incentives lacks empirical evidence. In contrast, recent banking studies indirectly raise questions as to the role of capital regulation on sub-debt issuance by highlighting that this regulation is of secondary importance for the general debt-equity choice by banks as

[9] A special thank you to Larry Wall, Maria Nieto, Christian Eufinger, Harald Benink and seminar participants at the 2018 Financial Management Association Conference, 2018 World Finance Conference and 2018 Essex Finance Centre Conference on Banking and Finance for the valuable comments and suggestions on this chapter.

[10] The capital requirements have always allowed a fraction of regulatory capital to be met by sub-debt. For instance, Basel III recognizes the instrument within the aggregate Tier 2 quota of 2% of risk-weighted assets, while Basel I and Basel II allowed up to 2% of the total capital adequacy ratio to be satisfied by sub-debt (Federal Reserve System, 1989; 2007; 2013). Before Basel I, sub-debt counted towards the 0.5% quota for Tier 2 components (Federal Reserve System, 1982; 1985a).

compared to market discipline and non-bank specific factors (Brewer III et al., 2008; Flannery and Rangan, 2008; Gropp and Heider, 2010). Along these lines, several corporate finance studies highlight that junior (sub-) debt is present in the capital structure of non-financial firms (Badoer et al., 2017; Colla et al., 2013; Linn and Stock, 2005) and propose explanations as to why firms rely on sub-debt that are unrelated to capital regulation (for example, Attaoui and Poncet, 2013; Hackbarth and Mauer, 2012; Rauh and Sufi, 2010).

In this study, we present the first empirical analysis that contrasts the importance of the regulatory capital motive for the issuance of sub-debt with other potential motivations and assess to what extent bank risk-shifting incentives lie behind the regulatory motive. In doing so we account for the fact that the issuance of sub-debt is not the only, and most effective, choice in terms of security issuance available to banks to significantly boost their regulatory capital ratio. We accordingly estimate a multinomial logit model where we jointly account for the determinants of the issuance of sub-debt and equity. Our empirical setting, therefore, allows us to compare the determinants of sub-debt and equity issuance and to understand when banks are induced to privilege the issuance of sub-debt over equity, as required by a risk-shifting strategy. We employ a sample of US listed and delisted banks for the period 1983 to 2015, with the start of our sample period coinciding with the application of the capital requirements to all banks, including multinational banks (Cornett and Tehranian, 1994). The US banking industry is an ideal setting for our analysis because of its long-dated series of sub-debt, and equity, issues that cut across all regulatory capital regimes and thereby fully capturing the intertemporal variations in the regulatory treatment of sub-debt.

To capture the importance of the regulatory capital motive on the issuance decision, we use as a key variable, the regulatory capital buffer; namely, a measure of the proximity of a bank's regulatory capital adequacy ratio to the minimum required. Banks with a lower buffer gain potentially more regulatory benefit from raising sub-debt. The importance of capital

requirements is then contrasted with a set of other determinants. These are based on theory arguments proposed for non-financial firms, and refer to tax benefits, growth opportunities, credit quality, volatility and financial constraints (see, Attaoui and Poncet, 2015; Barclay and Smith, 1995; Bolton and Freixas, 2000; Colla et al., 2013), and to motivations related to the presence of market discipline in bank debt quantity (Bennett et al., 2015; Billett et al., 1998).

In a set of preliminary univariate tests we show that banks issuing sub-debt are characterized by a lower regulatory capital buffer than the other sampled banks. A significant difference in the capital buffer is, however, also present between issuers of equity and non-issuing banks. Furthermore, this preliminary analysis suggests that banks issuing sub-debt differ in other non-regulatory aspects from non-issuers, being for instance larger and less risky, having more growth opportunities and better credit quality. These latter differences are, nevertheless, not supportive of the theoretical predictions proposed for non-financial firms but simply signal easier entry conditions to the debt market.

To further understand the role played by capital regulation, we next conduct an additional and simple regulatory compliance test that isolates sub-debt issues that would not count towards regulatory capital.[11] We find that the majority of sub-debt issues (two-thirds) are eligible in regulatory capital and these issuances account for a significant portion of the value of the total sub-debt raised over the sample period. Taken together, these initial results show some preliminary support for the importance of the regulatory motive on the issuance decision but they also highlight that issuing banks are systematically different from non-issuers in several non-regulatory characteristics.

[11] Among others, sub-debt should not be secured, guaranteed, insured or have credit enhancing or repayment acceleration features; but, should be subordinate to depositors and have a minimum original maturity of 5 years (7 years before Basel I). The instrument is also restricted in regulatory capital, alongside other Tier 2 elements (see, Federal Reserve System, 1985a; 1989; 2007; 2013).

To compare the relative importance of regulatory and non-regulatory variables, we then proceed by estimating a multinomial logit model, where the decision to issue sub-debt or equity is portrayed as depending on the regulatory capital buffer, bank-specific characteristics and macroeconomic controls. Under this multivariate setting, we find further evidence of a strong negative relationship between the regulatory buffer and the likelihood to issue both sub-debt and equity. In contrast, we find that most of the other possible determinants of the issuance decision of sub-debt are not significant in our sample of banks. In particular, we only find an increase in the likelihood to issue sub-debt when banks are larger and less risky or during periods of high term premiums. In general, the non-regulatory drivers of the issuance decisions reflect explanations based on the entry conditions to the debt market. Further, with the exception of the impact of tail risk, signaling a role for market discipline in debt quantity, the impact of the non-regulatory variables on the sub-debt issue decision is smaller than the impact of the buffer variable.

A possible interpretation of the buffer result is based on the likelihood that banks with low regulatory buffers may also be characterized by a higher probability of distress, which could induce low-buffer banks to shift risk towards creditors by leveraging up with debt instead of issuing equity (Admati, 2014; Admati et al., 2018). Therefore, our results may capture the risk-shifting incentives of distressed banks that might emerge via capital regulation. However, against this argument our initial analysis shows that the regulatory buffer plays a similar role on the issuance of sub-debt and equity; namely, banks with a low buffer are also more likely to increase the high quality component of the regulatory capital. Thus there does not seem to be a substitution effect between sub-debt and equity when banks possess low regulatory buffers. Also, these arguments would contradict the evidence that poorly capitalized banks are more likely to issue equity than other banks because of market pressure (Dinger and Vallascas, 2016). Moreover, the position is at odds with market

discipline theories (see, for instance, Niu, 2008a; 2008b) that suggest that riskier or distressed institutions might find difficulties in raising sub-debt.

Nevertheless, we proceed with further tests to document that the issuance decision of banks with a low regulatory buffer is significantly influenced by the presence of market discipline in debt quantities and this discipline constrains risk-shifting opportunities. To put it differently, we show that banks more exposed to tail risks and reporting a low regulatory buffer are significantly less (more) likely to issue sub-debt (equity) than less-risky ones. Intuitively, it appears that issues by low buffer banks with a high tail risk exposure are penalized by investors (Imai, 2007; Niu, 2008b) and are rationed out of the sub-debt-market (Covitz and Harrison, 2004) - these banks being then induced to issue equity.

Our baseline analysis, where size appears a strong predictor of the issuance decision, raises the possibility that the use of sub-debt to improve regulatory capital ratios is primarily, or even entirely, an option for larger banks. Given that larger banks may not be subject to any market discipline because of too-big-to-fail arguments (Bhagat et al., 2015; Hagendorff et al., 2018) - as also suggested by recent studies on market discipline in debt prices (see, for instance, Acharya et al., 2016) - then they might be inclined to increase their leverage via sub-debt issuance (even when they become riskier). When we extend the initial specification with an interaction term between the regulatory buffer and bank size, we indeed find that the issuance likelihood increases significantly for large banks, but especially so when they have a low regulatory capital buffer. Small banks show, instead, a very low likelihood to issue sub-debt at any level of capital buffer, though the issuance is more likely when their capital buffers are low.

Nevertheless, further tests indicate that the size effect is unlikely to be driven by a too-big-to-fail argument that undermines market discipline and facilitates risk-shifting by large banks. In fact, we document that larger banks are penalized in the sub-debt market when

they are more exposed to tail risk with the consequence of being more likely to issue equity when they are riskier. Furthermore, we find that the use of sub-debt as a tool to improve the regulatory capital buffer is primarily driven by the issuance decision of larger banks with low tail risk exposure. Small banks with low buffers show low probabilities to issue sub-debt independently of their tail risk exposure.

All in all, our findings show the key importance of the regulatory explanation of sub-debt issuance ahead of non-regulatory arguments and highlight how the regulatory motive is influenced by the presence of market discipline in debt quantities. More broadly, our analysis documents that general entry conditions to the debt market, as highlighted by studies on non-financial firms (Barclay and Smith, 1995; Blackwell and Kidwell, 1988), and not risk-shifting opportunities, primarily shape the security issuance decision and the related choice between sub-debt and equity, when banks have low regulatory buffers. Furthermore, by highlighting systematic differences between issuers and non-issuers of sub-debt, our study shows the importance of accounting for selection bias in any investigation of market discipline in debt prices.

Our analysis is related to the limited number of studies that investigate the drivers of sub-debt issuance by banks (Covitz et al., 2004; Covitz and Harrison, 2004; Hancock and Birchler, 2004; Schandlbauer, 2014; 2017). In particular, the studies of Covitz et al. (2004) and Hancock and Birchler (2004) are closely related to this review. Their analyses, however, focus on the influence of deposit insurance regimes on sub-debt issuance, while this work focuses on the role of capital requirements and non-regulatory explanations. In addition, these studies do not compare the determinants of the sub-debt issuance decision with the determinants of equity issuance and do not investigate the potential influence of risk-shifting opportunities.

The study of Schandlbauer (2014) directly compares to ours by estimating the probability of issuing sub-debt alongside other capital elements. However, the study depicts sub-debt as just another liability element that banks can use. It is therefore, not surprising that in the setting where banks are supposed to adjust towards the primary capital ratios, they (banks) rather apply sub-debt to deviate from these targets. Accordingly, the regulatory role of sub-debt in this context is not precisely explained, as banks appear to use the instrument for purposes that could range from tax benefits, signalling of financial strength or contribution to total capital. Basically, our study overcomes the limitations of Schandlbauer (2014) by determining the specific factor underlying the issuance of sub-debt, thus regulation.

More generally, our study is related to the literature on the role of sub-debt in the banking industry. This literature emphasizes sub-debt as a potential source of market discipline via the higher cost of funding imposed by risk-sensitive sub-debt holders (Flannery and Sorescu, 1996; Niu, 2008b). However, this disciplinary ability via debt prices has been shown to be effective only when sub-debtors do not expect to be bailed out (Balasubramnian and Cyree, 2011; 2014; Baron, 2017; Nier and Baumann, 2006). Furthermore, in the case of commercial banks, the disciplinary effect of sub-debt only materializes when the debt is held by the parent holding company (Belkhir, 2013) or the sub-debt contracts have strict covenants (Ashcraft, 2008; Goyal, 2005). Differently from these studies, our analysis places emphasis on market discipline via debt quantity and on its interplay with the regulatory motive of the issuance decision.

Finally, we contribute to the studies on how regulation influences the funding choices of banks (Brewer III et al., 2008; Dinger and Vallascas, 2016; Gropp and Heider, 2010; Krishnan et al., 2010). The extant studies focus on the choice between debt and equity in the capital structure, and not specifically on the decision to issue sub-debt or on how this

decision differs from the decision to issue equity. Our analysis relies on the fact that sub-debt in banking has a regulatory aspect that may affect the issue behavior of banks.

The remainder of this analysis is organized as follows. Section 3.2 reviews the literature, while Section 3.3 describes the data. Section 3.4, discusses the econometric model and variables, while Section 3.5 presents the empirical results of how regulation influences the issuance activity of banks. Section 3.6 concludes the study.

3.2 Related Research

There is a long debate in the banking literature on the relative importance of regulation and other factors in driving the capital structure and the equity issuance decision of banks (see for instance, Cornett et al., 1998; Cornett and Tehranian, 1994; Gropp and Heider, 2010; Polonchek et al., 1989). The most recent studies argue that the capital structure and the equity issuance of banks are affected by factors similar to those affecting non-financial firms and regulation is not binding (Brewer III et al., 2008; Gropp and Heider, 2010). Although this literature has focused on the equity ratio and equity issuance, a comparative analysis of regulatory and non-regulatory motives can be also applied to sub-debt issuance. In particular, a regulatory explanation, largely ignored by previous studies on sub-debt issuance by banks (see, Covitz et al., 2004; Hancock and Birchler, 2004), sees the inclusion of sub-debt in the regulatory capital as a potential key determinant of issuance. The regulatory motive of the issuance decision might especially appeal to banks with high risk-shifting incentives (such as less capitalized, riskier or even larger banks) because of the opportunity to improve the regulatory capital ratio via debt. However, this is less likely to occur in the presence of market discipline in debt quantities that sufficiently penalize weaker institutions and makes it difficult and expensive to raise risk-sensitive securities that suffer losses in the case of bank default (Berger, 1995; Park and Peristiani, 1998).

Explanations for the issuance decision of sub-debt unrelated to regulation are instead proposed by studies on the use of junior (sub-) debt by non-financial firms. For instance, the issuance of sub-debt might be intended to modify the debt priority structure of a firm because of the growth opportunities of the corporation - firms with high growth opportunities, and consequently larger creditor-shareholder conflicts, normally opt for a greater use of senior claims (Barclay and Smith, 1995).

Other explanations are normally built around conventional determinants of capital structure decisions. For instance, companies that are keen to obtain tax benefits should rely more on riskier debt such as sub-debt (Barclay and Smith, 1995). Along these lines, Sundaresan and Wang (2016) argue that the use of sub-debt in capital regulation is not for the good of depositors, but is a source of tax benefits for value maximizing banks. Likewise, De Mooij and Keen (2016) and Schandlbauer (2017) find that an increase in tax causes banks to hold more debt because of the resultant tax shield while Schandlbauer (2014) presumes that banks could be using sub-debt for signalling, capital or tax purposes. In a related analysis, Attaoui and Poncet (2013) frame the optimal priority structure of debt in the context of the tradeoff between tax benefits and bankruptcy costs. In their model, and against the risk-shifting argument, low leverage firms use more junior debt, while high leverage firms increase their proportion of long-term senior debt when their assets are riskier.

More recently, Badoer et al. (2017) show that an increase in firm volatility leads to an increase in the issuance of secured debt and sub-debt. This is explained by an increase in the cost of senior debt induced by volatility as compared to secured and sub-debt. Hackbarth and Mauer (2012) model how capital structure and debt priority structure interact with investment policy when i) there is a stockholder-bondholder conflict over investment, and ii) corporations account for how future investment is financed. They show that firms with high external financing costs (e.g., small and financially constrained firms), and especially

riskier firms with high financial distress costs rely more on junior debt. This is consistent with Rauh and Sufi (2010) and Colla et al. (2013), who build on the theoretical research on the importance of credit quality for the optimal debt structure (see among others, Bolton and Freixas, 2000; Diamond, 1991a; 1991b) and show that sub-debt is primarily used by firms with lower credit quality. All these studies refer to the concept of priority spreading indicating that firms increase the use of secured and subordinated debt and reduce the use of senior debt as their credit quality deteriorates.

The predictions of the models described above, however, do not conform to the explanation of the issuance by riskier institutions, or by institutions with a low credit quality, related to market discipline arguments that apply to debt quantities (Berger, 1995; Park and Peristiani, 1998). For instance, it has been shown that banks move from risk-sensitive securities to insured deposits when they become riskier (Bennett et al., 2015; Billett et al., 1998).[12] In some cases, banks have to recapitalize and reduce their risk levels before they can enjoy favorable entry conditions in the uninsured debt market (Berger, 1995).

We, therefore, employ the different theories discussed in this section to examine the role of regulatory and non-regulatory arguments proposed for non-financial firms (see mainly, Attaoui and Poncet, 2013; 2015; Colla et al., 2013; Hackbarth and Mauer, 2012) on the decision to issue sub-debt by banks. Accordingly, our study complements analyses on bank security issuance, that to date have primarily focused on the equity market (for example, Cornett et al., 1998; Dinger and Vallascas, 2016; Krishnan et al., 2010).

[12] This liability rebalancing, however, thwarts market discipline efforts as protected depositors are generally insensitive to risk (Demirgüç-Kunt and Huizinga, 2004; Karas et al., 2013).

3.3 Data

The sample of banks used in our analysis is drawn from the population of 2145 publicly traded and delisted US banks available in Compustat-Capital IQ for the period ranging from January 1, 1983 to December 31, 2015. More precisely, we retain from Compustat firms with SIC codes from 6020 to 6036.

To identify banks issuing sub-debt over the sample period, we extract a list of 4,604 sub-debt issues made by 1,725 financial institutions from Bloomberg and Thomson One Banker. The issues are then merged (using the Cusip identifier) to the bank population dataset to filter out non-bank issuers. This process results in a sample of 512 sub-debt issues by 174 unique banks after eliminating issuers that have also issued equity in the same quarter, those without accounting data, and consolidating duplicate time issues (more than one issue in a quarter).[13]

We next extract from Thomson One Banker data on equity issuance via Seasoned Equity Offers (SEOs) over the same period. This allows us to consider the fact that banks can primarily use equity issuance to rapidly improve their regulatory capital ratios and to compare the determinants of sub-debt and equity issuance. We remove offers without a Cusip identifier, or the amount issued, as well as those that have no impact on the capital structure; namely, withdrawn or pure secondary offers. In particular, proceeds from secondary offers just flow between investors and do not accrue to the bank. Furthermore, we drop issuers

[13] We identify only 14 cases where a bank issues both sub-debt and equity in the same quarter. While given our econometric setting, explained in section 3.4 and the very low number of cases, we cannot consider these cases as being part of a different category of events, their exclusion is unlikely to affect our findings. For instance, we achieve similar conclusions if we classify the 14 cases either as only sub-debt issuance or as only equity issuance. Furthermore, our results do not vary if we classify each of the 14 cases to the issuance category referring to the first type of security issued by banks in each of the quarters during which these issues occurred.

that have also issued sub-debt in the same quarter and remove duplicate time issues to arrive at a final sample of 585 SEOs by 371 unique banks. Lastly, we obtain stock prices and macroeconomic data from the Centre for Research in Security Prices (CRSP).

[Insert Table 3-1]

Table 3-1 shows the distribution of sub-debt issuance and SEOs over the sample period. Both types of issuance are not very frequent in our sample, an observation consistent with studies on the liability or capital structure of banks (see, Ashcraft, 2008; Belkhir, 2013; Bennett et al., 2015; Dinger and Vallascas, 2016). On average, only 2% (3%) of total bank-quarter observations in our study issued sub-debt (equity) between 1983 and 2015. Both security issues account for an average of 3% per bank over the same period.

However, the importance of the two types of issuance evolves differently over time. Sub-debt issuances are more frequent in the early part of the sample period, while SEOs become more common in the latest part of the sample. The early period was characterized by the rescue of Continental Illinois liabilities, which failed in 1984, and the subsequent explicit guarantee for other large banks (Covitz et al., 2004; Flannery and Sorescu, 1996). These actions potentially drove sub-debt issues as the uninsured creditors presumed some state protection. The equity issues in the most recent years are possibly an aftermath of the Capital Purchase Program (CPP). Khan and Vyas (2015) points out that CPP recipients were more likely to issue equity to repay their CPP debt.

Figure 3-1 presents the distributions of the two types of security issuance in terms of amount raised. Sub-debt raised the most proceeds despite being relatively less frequent as compared to SEOs. The value distribution suggests that banks, like non-financial firms, limit wealth losses arising from adverse selection by issuing lower amounts of SEOs (Choe et al., 1993).

[Insert Figure 3-1]

3.4 Econometric Model and Variables

We apply a multinomial logit model to estimate the probability of issuing sub-debt or equity in a given quarter. Our dependent variable (**ISSUE**) is a tripartite outcome taking a value of 0 for "no issuance", 1 for "sub-debt issuance" and 2 for "equity issuance". Furthermore, we control for unobserved time-variant factors, and potentially omitted macroeconomic variables, by including year dummies.[14] We cluster standard errors at the bank-level to control for across time error correlation within banks. More formally, the baseline model assumes the following specification:

$$\text{mlogit}\{prob(ISSUE_{i,t} = 0,1,2 \mid X_{i,t-1})\} = \alpha + \gamma BUFFER_{i,t-1} + \beta X_{i,t-1} + TIME + \varepsilon_{it} \qquad (1)$$

Where **BUFFER** measures the difference between a bank's regulatory capital adequacy ratio and the minimum regulatory requirement. Banks with low buffers are expected to access the capital markets in an attempt to improve their regulatory capital ratios and mitigate regulatory pressure. Sub-debt then stands as one of the recapitalization options for these banks given its recognition as a form of regulatory capital.

We construct the buffer variable by taking into account the variations in the minimum regulatory capital requirement over our sample period.[15] **X** and **TIME** are a vector of

[14] In additional tests, reported as additional tables, we show that our main results remain unchanged when year dummies are replaced with quarterly dummies (see, Table A.3-2).

[15] There are no regulatory capital ratios on Compustat-Capital IQ before 1993. We overcome this hurdle by computing the missing ratios guided by the Federal Reserve Bulletins of the Federal Reserve System and Krishnan et al. (2010). However, the unavailability of key regulatory data such as risk-weighted assets still present challenges in the calibration of the ratios across the Basel I transition period (1990 to 1992). The capital ratios from 1985 to 1992 are, therefore, based on similar regulatory criteria, in spite of the Basel I transition requirements (see, Federal Reserve System, 1989); notably, observations in the transition period account for just 4 percent of the total observations. At this magnitude, we deem the likely error in the capital calculation to pose a low risk to our inferences.

controls and time dummies, respectively, while $\boldsymbol{\varepsilon_{it}} \sim N(0, \sigma)$ is the error term. We winsorize the continuous variables at the 1% and 99% level to limit the effects of outliers, and we measure the covariates at a quarterly lag to reduce endogeneity and simultaneity biases.

We next include bank-specific and macroeconomic variables that are deemed to drive the issuance of sub-debt (and equity) by institutions independently of the regulatory context. We control for bank size (**Size**) via the logarithm of total assets. Large institutions should be more likely to issue sub-debt and equity given the economies of scale they gain when issuing public securities and the related lower flotation costs (Barclay and Smith, 1995; Covitz et al., 2004). Furthermore, large banks are more likely to receive a bailout in the case of distress (Acharya et al., 2016; Balasubramnian and Cyree, 2011; Berger and Bouwman, 2013) and while this is supposed to ease access to the sub-debt market (Balasubramnian and Cyree, 2014; Beyhaghi et al., 2014), it could also discourage banks from raising equity via SEOs (Dinger and Vallascas, 2016). Nevertheless, against these arguments, the model proposed by Hackbarth and Mauer (2012) highlights that financially constrained firms (as it should be the case of smaller banks) should favor junior (sub-) debt.

Next, we control for the log of the number of years (**Bank Age**) a bank appears in Compustat (years since IPO). Younger banks, with a less established reputation in the banking market, should experience higher external financing costs. Similar to non-financial firms, this could prompt them to specialize in one form of debt, thus limiting their access to alternative funding securities such as sub-debt (Colla et al., 2013). In contrast with this argument, Hackbarth and Mauer (2012) argue that younger institutions are financially constrained, hence they would prefer sub-debt and defer senior securities for their future

Table A.3-1 of the additional tables summarizes developments on regulatory capital requirements in the US.

funding needs. Younger banks are also expected to rely on equity issues to support growing investment opportunities, whereas more mature firms opt for internally generated financial resources (DeAngelo et al., 2010).

We also control for the effect of taxation (**Tax**), measured as the ratio of taxes to pre-tax earnings. The tax-deductibility of interest payments enables institutions to maximize their tax shield by issuing more junior debt (Attaoui and Poncet, 2013; 2015). Higher tax rates should then lead banks to issue sub-debt in preference to equity (Schandlbauer, 2017). We then account for the "contracting costs" arguments that institutions with high growth opportunities are less likely to issue sub-debt (Barclay and Smith, 1995). For these institutions, high priority claims provide an essential threat of liquidation upon inappropriate or risky investments, thus abating the asset-substitution and under-investment problems associated with them (growth firms). Similarly, and according to the market timing perspective, firms should issue equity when their shares are overvalued (Baker and Wurgler, 2002; Cornett and Tehranian, 1994; Krishnan et al., 2010). We capture a bank's growth opportunities as the market value of equity divided by the book value of equity (**Tobin's Q**).

Firm risk and the credit quality of the issuer may also affect the issuance decision via their effects on the debt structure (Badoer et al., 2017; Colla et al., 2013; Rauh and Sufi, 2010) and on the overall capital structure (Bolton and Freixas, 2000; Kisgen, 2006; 2009). We measure bank risk by means of **Tail Risk**, defined as the (minus) average equity loss when a bank's returns are in the lower 5^{th} percentile of the quarterly distribution of its daily stock returns (Acerbi and Tasche, 2002). This measure indicates large wealth losses not only for shareholders but potentially also for debtholders (Hagendorff et al., 2018). In particular, debtholders, by holding fixed claims on a bank's cash flows, are likely to lose some of their principal in the presence of extreme large losses in bank value as indicated by high values of

tail risk. We measure the credit quality of the issuer via a dummy variable equal to 1 for banks with a S&P rating of BBB- or better (investment grade), or 0 otherwise (**Credit Quality**).

Other controls are related to capital structure decisions. The Return on Assets (**ROA**), measured as pre-tax earnings divided by total assets, controls for the performance of the bank. Profitable institutions are able to service their payment commitments, hence they are more likely to issue debt securities (Gropp and Heider, 2010). Nonetheless, earnings accumulated by profitable institutions might create little need for external equity capital, thus reducing the probability of an SEO (Frank and Goyal, 2009). The ratio of total deposits to total assets (**Deposits**) controls for the possibility that banks might resort to external financing when they have exhausted cheaper sources of funding, in terms of deposits (Belkhir, 2013; BIS, 2003). Khan and Vyas (2015) show that US banks that received public support through the 2008 Troubled Asset Relief Program (TARP) have a higher likelihood of issuing equity in the following quarters. We, therefore, add a dummy (**TARP**) equal to 1 for the period a bank took part in the TARP program, or 0 otherwise.[16]

We also control for the rate of change in the consumer price index (**Inflation**) as previous studies have shown a positive association between leverage and inflation (Frank and Goyal, 2009; Oeztekin, 2015). High inflation reduces the real cost of funding, however, investors may also withhold capital if their nominal returns are diluted by higher inflation (Fan et al., 2012). Finally, the model also accounts for economic growth opportunities as captured by the difference between the yield on the 10-year and 1-year treasury bonds (**Term Premium**). The spread between long and short-term rates signals strong future economic performance (Erel et al., 2012). Previous studies on non-financial firms, focusing on the demand-side

[16] We extract the list of banks that received state assistance from www.propublica.org.

drivers of the issuance decision, show that equity issuances are common during favorable economic times due to lower adverse selection costs associated with equity announcements during these times (Bayless and Chaplinsky, 1996; Choe et al., 1993). For banks, however, equity issuances are counter-cyclical (Baron, 2017), and the related decline of equity issuance in booming conditions might favor an increase in investor demand for high-risk securities such as sub-debt.

3.5 The Determinants of Sub-debt Issuance

3.5.1 Summary Statistics and Univariate Tests

Table 3-2 reports summary statistics for the variables described in the previous section, separately for three groups of banks: 1) non-issuers, 2) issuers of sub-debt and 3) issuers of equity.

[Insert Table 3-2]

The summary statistics highlight important differences across the three groups. For instance, issuers of sub-debt have significantly lower regulatory capital buffers as compared to non-issuers and issuers of equity. Furthermore, they are significantly larger, older and have a higher *Tobin's Q, ROA* and *Credit Quality* compared to other groups. Noticeably, sub-debt issuers also have a lower *Tail Risk* than others. All in all, it seems that the issuance of sub-debt is more likely in banks that have plausibly easier access to the bond market because of lower flotation costs and the ability to attract a larger supply of capital by investors (Blackwell and Kidwell, 1988; Colla et al., 2013). The highlighted differences in terms of size, risk and credit quality, and the lack of importance of the tax variable, do not conform to theoretical predictions based on demand-side factors (Attaoui and Poncet, 2013; 2015; Dong et al., 2012; Elliott et al., 2008; Gomes and Phillips, 2012). In terms of macro-controls, the comparative analysis of the three groups of banks shows that, differently from the other groups, sub-debt

issuers tend to time their activity to inflationary periods, which are associated with a lower real cost of funding. Furthermore, as in Khan and Vyas (2015), TARP banks are primarily in the group of equity issuers.

As a further examination of the potential role played by capital regulation, we next classify the security issues into the four quartiles of the *Buffer* distribution and compute the ratio between the number of issues and the number of banks in each quartile. Our analysis, reported in Panel B of Table 3-2, shows that the issuance frequency for both sub-debt and equity declines as the buffer increases. Notably, the fact that the frequency of sub-debt in the lowest quartiles is larger than the frequency of issuing equity confirms earlier indications that sub-debt issuers have significantly lower buffers than equity issuers.

Our data also allow us to distinguish sub-debt by a number of regulatory characteristics, including maturity and if the debt is insured, guaranteed or has step-ups/credit enhancement features. Although non-exhaustive, these characteristics reasonably cover important aspects that are required for sub-debt to be included as part of Tier 2 capital (see, Federal Reserve System, 1985a; 1989; 2007).[17] We are also able to assess the regulatory capacity of a bank by establishing if the sub-debt issued will count towards the regulatory quota allocated to Tier 2 elements. For this purpose, we observe the extent to which a bank has utilized its Tier 2 quota a quarter prior to the issuance of sub-debt. The measurement is simply the actual Tier 2 ratio before issuance less the required regulatory Tier 2 ratio, and takes into account the changes in capital requirements over our sample period. For example, Tier 2 elements were allowed up to 0.5% of total assets before Basel I, improving to 4% of RWA under Basel I and II, and can currently contribute 2% of RWA under Basel III (see, Federal Reserve

[17] Another key condition is that banks should seek prior regulatory approval for the early redemption of sub-debt. We could not establish this feature on issues that have a call and put options but are comforted by their relatively low representation (16%) in our sample.

System, 1985a; 1989; 2007; 2013). This information allows us to further understand the role of the regulatory standards on the issuance of sub-debt by identifying sub-debt issues that are expected to count towards regulatory capital and those that are not.

We report the result from this analysis in Panel C of Table 3-2. We find that 307 issues (equivalent to 60% of the total number of issues) are eligible for inclusion in regulatory capital based on the minimum qualifying criteria and a bank's regulatory capacity.[18] The amount raised through these eligible securities make a significant portion, 70%, of the total proceeds from sub-debt. Overall, the issuance of sub-debt seems to be generally designed in such a way to allow the issuing banks to employ the raised funds for regulatory purposes.

3.5.2 Baseline Multinomial Logit Model

Table 3-3 shows the regression results of the multinomial logit model employed to examine the determinants of the probability to issue sub-debt and equity. Columns (1) and (3) report the estimated coefficients for the sub-debt and equity equations, respectively. Columns (2) and (4) show the related marginal effects. We employ the non-issuance decision as a reference outcome. Therefore, the results refer to the probability to issue one type of security as compared to not issuing any. Furthermore, to facilitate the comparison between the two types of securities, in column (5) we present an estimation that compares the likelihood to issue sub-debt versus equity.

[Insert Table 3-3]

The results show that an increase in the regulatory capital buffer significantly reduces the probability to issue sub-debt and equity. That is, banks with lower buffers see the use of sub-

[18] Conversely, we identify 205 ineligible sub-debt issues, of which 72 do not meet the minimum maturity criteria of 5 years (7 years prior to Basel I), 112 are issued by banks that have already exhausted their Tier 2 quota, and 21 are jointly disqualified and over the Tier 2 threshold.

debt as an important tool when they need to improve regulatory capital ratios. The variable has similar impact on the issuance of sub-debt and equity (column 5), thereby indicating that sub-debt remains relevant to banks with low regulatory capital even with the presence of equity as an alternative recapitalization option. In an attempt to further understand the regulatory importance of sub-debt, we proceed by comparing the likelihood to issue sub-debt and equity by banks at various levels of the *Buffer* distribution. We plot the annualized probability to issue either security at different percentiles of the regulatory capital buffer in Figure 3-2.

[Insert Figure 3-2]

Figure 3-2 shows that banks appear more likely to issue equity than sub-debt at any level of the buffer. However, the difference between the likelihood to issue sub-debt or equity is not significant at the tails of the buffer distribution. This suggests that banks opt for any security that could boost their regulatory capital levels when they are on the edge of the minimum capital requirements, while those at the opposite end seem to have little regulatory incentive or pressure to issue.

More intriguing, however, is the high probability of issuing either security when banks are extremely less-capitalized, i.e. with a buffer at the 1st percentile of the buffer distribution. To put this into perspective, the annual likelihood to issue sub-debt or equity by banks with buffers at the 1st percentile is twice as high as that for banks with a buffer at the 10th percentile. In comparison to banks with a buffer at the 90th percentile of the distribution, the extremely less-capitalized banks are 10 and 6 times more likely to issue sub-debt and equity, respectively. It, therefore, appears that the high issuance likelihood by banks that are on the lower tail of the buffer distribution conceals the overall difference between the impact of the *Buffer* variable on sub-debt and equity issuance that is observed in Column (5) of Table 3-3.

While the regulatory motives seem to be an important driver of the issuance decision, we find little evidence on the influence of other explanatory variables. We particularly find that the only common bank-specific determinant between sub-debt and equity issuance is *Size*: the probability to issue both types of securities is higher in bigger banks. Overall, the role of *Size* on sub-debt tends to be consistent with the view that firms are more likely to rely on debt securities when they have better access to the debt market (Blackwell and Kidwell, 1988; Colla et al., 2013; Gropp and Heider, 2010). Furthermore, the likelihood to issue sub-debt is also larger when banks are characterized by a lower tail risk exposure. This is, therefore, against the evidence offered by models proposed for non-financial firms focusing on the demand for capital (for example, Dong et al., 2012; Elliott et al., 2008; Goyal and Wang, 2013; Hackbarth and Mauer, 2012) and is more consistent with the related presence of market discipline in debt quantities, where informed risk-sensitive investors avoid being exposed to risky institutions (Erel et al., 2012; Hancock and Birchler, 2004; Park and Peristiani, 1998).

Other bank characteristics influence the likelihood to issue equity but not the issuance of sub-debt. The likelihood to issue equity decreases with *Bank Age*, in line with the argument that younger firms issue equity to support growing investment opportunities, while more mature firms prefer to opt for internally generated financial resources (DeAngelo et al., 2010). Furthermore, the likelihood to issue equity increases with the availability of growth opportunities (*Tobin's Q*), confirming that banks tend to issue equity when their shares are overvalued (Cornett and Tehranian, 1994; Krishnan et al., 2010). In addition, banks rescued by the TARP are more likely to issue equity as suggested by Khan and Vyas (2015).

As for macroeconomic controls, we find that a larger *Term Premium* increases the likelihood to issue sub-debt while it decreases the likelihood to issue equity. These

observations suggest that banks meet their funding needs with sub-debt as economic opportunities enlarge, while equity is mainly countercyclical as suggested by Baron (2017).

To elaborate on the economic importance of the regulatory variable against other variables for the issuance decision, Panel B of Table 3-3 compares the marginal effects of *Buffer* with the marginal effects of the other significant variables in the sub-debt equation (namely, *Size, Tail Risk* and *Term Premium*). With the exception of *Tail Risk*, the impact of these variables is significantly lower than the impact of *Buffer*.

The above findings are further highlighted in Table 3-4, where we report the quarterly probability to issue sub-debt by banks at the 25th or 75th percentile of the sample distribution for the variables that enter with a significant coefficient in the sub-debt equation. Specifically, we show the probability to issue when banks are at the 25th or 75th percentile of the *Buffer, Size* and *Tail Risk*, or when the *Term Premium* is at the same percentiles. To improve our understanding of the specificities of sub-debt issuance, and of the more general funding choices implemented via security issuance, we also report similar information for equity issuance.

[Insert Table 3-4]

We find that when the regulatory capital buffer declines from the 75th to the 25th percentile, the quarterly probability to issue sub-debt increases from 0.47% to 1.14%, and the increase is larger (in absolute terms) as compared to what we observe for a similar change in the non-regulatory variables. Coupled with the marginal effects reported for each variable in Table 3-3, these results point to the importance of the regulatory variable (*Buffer*) in the sub-debt issuance decision.[19]

[19] As an alternative test, we account for short-term variations by including quarterly time dummies in our model. Except for the *Term Premium*, other factors remain quantitatively similar, while *Inflation*

The findings discussed in this section offer indications in favor of a significant influence of capital regulation on the issuance decision of sub-debt while offering limited support to non-regulatory explanations. In particular, our analysis does not support theoretical predictions proposed for non-financial firms related to the importance of tax benefits, growth opportunities or credit quality in the issuance of junior (sub-) debt. If there is any role for non-regulatory motives on the issuance decision, this role is associated with factors that ease entry conditions to financial markets, such as a larger size and a lower tail risk exposure.

3.5.2.1 Sub-Sample Analysis and Alternative Specifications

It could be argued that our results do not fully capture the demand and supply dynamics that have a potential bearing on the issuance of sub-debt. Apart from the time and macroeconomic conditions (which we control for), these market interactions could be influenced by changes in the conditions that qualify sub-debt in the regulatory capital, with the most prominent being the implementation of Basel I in 1990 (Federal Reserve System, 1989). The adoption of Basel I increased the proportion of sub-debt in capital but also ceded investor-control to the regulators by eliminating covenants on regulatory sub-debt (Ashcraft, 2008). The interaction between these demand and supply effects would then be different pre- and post-Basel I implementation, making it difficult to capture these dynamics with a reduced form specification.

To account for the change highlighted above, we follow Ashcraft (2008) and split the sample between the pre-Basel I and Basel I regime, where the former is the period before the implementation of Basel I in 1990, otherwise all other periods fall under the Basel I

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enters the sub-debt model as significantly negative (see, Table A.3-2). Nevertheless, the *Buffer* variable still has the greatest impact on the issuance of sub-debt when compared to *Size, Tail Risk* and *Inflation*.

regime. We, however, omit the post Basel II proposal period (after 2002) to avoid contamination effects related to the announcement of further changes in capital regulation (see, Federal Reserve System, 2003 for the proposed Basel II rules). We report the regression results and the associated marginal effects for the buffer variable under Table A.3-3a where columns 1 to 3 are the estimates for the pre-Basel I regime (1983-1989) while columns 4 to 6 are with respect to the post-Basel I regime (1990-2002). We find that the *Buffer* is important to the decision to issue sub-debt regardless of the regulatory capital regime (Panel A). Panel B further shows that the decision to issue sub-debt is still significantly important for banks with low regulatory buffers. Moreover, the importance of the buffer does not vary across the regulatory regimes as shown in Panel C (column 4). Similar results are confirmed even when the Basel I regime extends to 2005; namely, a year prior to the international announcement of Basel II as reported in Table A.3-3b.

Equally, the tendency of banks to remain undercapitalized during adverse periods (see, Berger and Bouwman, 2013; Dinger and Vallascas, 2016) could impact on the likelihood of banks issuing sub-debt during the 2007-2009 global financial crisis. To eliminate these potential effects, we run our tests up to 2006 and find that the impact of the *Buffer* on sub-debt issuance remains consistent with the main findings (See, Table A.3-4).

Another caveat is that our dataset is characterized by the lack of direct information on regulatory capital ratios before 1993 (that we have overcome by following Krishnan et al. (2010)). Bearing this in mind, we repeat the analysis focusing only on the sub-period 1993-2015. This exercise excludes 184 issues by 74 banks. We still find the likelihood to issue sub-debt (or equity) is larger when banks are characterized by a lower regulatory capital buffer (Table A.3-5, Panels A and B). We conclude, therefore, that our pro-regulatory motive finding is robust to changes in the period of the analysis.

More importantly, security issuance is not the only means through which banks can improve their capital adequacy ratios hence we account for the possibility that banks could adopt internal measures for this purpose. Specifically, banks could build their capital base by reducing dividends or deleveraging through asset reduction. To examine this issue, we assign an additional category to the dependent variable that is equals to 3 if a bank cuts dividends and/or reduce assets in a particular quarter, collectively defined as "Internal". Other categories remain as previously, thus 1 for sub-debt, 2 for equity and 0 for no-issuance (base outcome). We report these results in Table A.3-6 and Panel A shows that the *Buffer* still plays a prominent role in the recapitalization decision of banks. Nevertheless, banks with low buffers are more likely to improve their capital ratios through security issuance viz., sub-debt or equity, while those with higher buffers are most likely to build capital through internal means (as further confirmed by Panel B). These findings suggest that banks with sufficient capital can "leisurely" build their capital base, but those pressed for capital adopt an instant recapitalization strategy, thus security issuance (also see, Dinger and Vallascas, 2016).

We next add further controls to our baseline specifications to exclude the possibility that our findings are driven by the effect of omitted variables that are captured by the regulatory capital buffer. Specifically, we control for the loan to asset ratio as loans are normally characterized by higher risk-weights and, as such, influence the regulatory capital ratio. We also jointly control for the ratio of non-performing loans to total assets, and the ratio of other real estate loans to total assets to account for the riskiness of the credit portfolio. Our results remain similar (TablesA.3-7a and A.3-7b).

Finally, we eliminate the possibility that our results could be driven by econometric bias by re-estimating our baseline specification using the multinomial probit model as an alternative econometric setting, and the ordered probit model as a way of accounting for potential pecking order in the security issuance decisions (Myers and Majluf, 1984). The

multinomial probit model results shown in Table A.3-8 still find a negative relationship between *Buffer* and sub-debt issuance. In addition, the results of the ordered probit model in Table A.3-9 suggest that there are no ordering preferences in the issuance of sub-debt or equity since low-buffer banks are equally likely to issue either security. The difference between these security choices is insignificant (column 5). Perhaps, the relatively cheaper issuance costs of sub-debt (see, Boyson et al., 2016) offset the faster recapitalization benefits associated with equity, resulting in this indifference.

3.5.3 Regulatory Versus Risk-Shifting Motives

A possible interpretation of our results is related to the likelihood that banks with a lower regulatory capital buffer could also have a higher probability of distress. In turn, this could induce low-buffer banks to shift risk towards creditors by privileging debt issuance over equity issuance (Admati, 2014; Admati et al., 2018). Our result, therefore, could be a consequence of sub-debt being used as a tool to further increase bank leverage by poorly capitalized banks taking advantage of the regulatory motive.

The interpretation above, however, would contradict the evidence that poorly capitalized banks are more likely to issue equity than other banks because of market pressure (Dinger and Vallascas, 2016). In addition, the position is at odds with market discipline theories (see, for instance, Niu, 2008a; 2008b) which suggest that riskier or distressed institutions might find difficulties in raising sub-debt. Furthermore, and more importantly, our analysis shows that banks with lower buffers are also more likely to issue equity. That is, we do not find evidence of a substitution between equity and sub-debt when banks have lower regulatory capital.[20]

[20] In contrast, untabulated tests show that the estimated probability to issue equity and sub-debt are positively and significantly correlated in our sample (r=0.22; p-value=0.000).

Nonetheless, we further exclude the possibility that our results are capturing a risk-shifting motive of poorly capitalized banks in the following sub-sections, where we observe the sub-debt issuance behavior of risky banks, and more especially when they are large. These motives would be most pronounced in banks that are risky as they may attempt to offload their vulnerable positions to other stakeholders, and large banks - since expectations for a bailout usually incite them to be riskier (Afonso et al., 2014; Hagendorff et al., 2018; Taleb and Tapiero, 2010).

3.5.3.1 Regulatory Capital Buffer and Tail Risk

In this analysis, we offer further evidence against a risk-shifting strategy being behind the regulatory motive of the issuance decisions. To this end, we focus on the interplay between *Buffer* and *Tail Risk*. The observed negative impact of *Tail Risk* on the likelihood that banks issue sub-debt indicates the presence of market discipline in debt quantities. This market discipline mechanism might then reduce opportunities for banks with a low regulatory buffer to rely on debt to improve their regulatory ratios when they are more exposed to extreme losses; namely, when they have more incentives to shift risk towards creditors and the financial safety net. To verify the validity of this argument, in Table 3-5, we extend the baseline specification reported in Table 3-3 with an interaction term between *Tail Risk* and *Buffer*.

However, the sign and significance level of the coefficient associated with the interaction term is not informative as to the direction and magnitude of the interaction effect in non-linear models (Hoetker, 2007). More specifically, the interaction effects can be significant for some observations although the interaction coefficient is not significant, while some observations may not be significant in spite of a significant interaction coefficient (Hoetker, 2007, p.336). It is in this respect that Hoetker (2007) advocates for the interaction effects to be calculated at given values, and hence, like other recent literature in this field (i.e. Berger

and Bouwman, 2013; Dinger and Vallascas, 2016) we rely on the computation of predicted probabilities for banks at different regulatory buffers and different exposures to tail risk. That is, we calculate the interaction effects when a bank's buffer and tail risk are at the lower quartile (25th percentile) and upper quartile (75th percentile) of the *Buffer* and *Tail Risk* distributions. In this regard, Panel A of Table 3-5 reports the results of the regression model while Panel B shows the predicted probabilities, and their differences, to issue sub-debt and equity for low- and high-buffer banks when these banks have low (a value equal to the 25th percentile of the sample distribution) or high (a value equal to the 75th percentile of the sample distribution) exposure to *Tail Risk*. Panel C reports the associated marginal effects of low-buffer and high-buffer banks when they have low and high tail risk.

[Insert Table 3-5]

We find that banks with a lower regulatory capital buffer are more likely to issue sub-debt when they are less exposed to tail risk. Risky banks instead issue significantly more equity at all levels of regulatory capital than less-risky ones, but more especially when they have a low regulatory capital buffer. To put our analysis into perspective, it is worth noting that the annual probability that a low buffer bank with low tail risk issues sub-debt is 4.83% against a probability of 3.74% when a bank is riskier. In contrast, the annual probability that a low buffer bank with low tail risk issues equity is around 4.47% against a probability of 5% when a bank is riskier.

Essentially, our analysis suggests that risky banks with a lower regulatory capital buffer are pushed by concerns over default risk to recapitalize with equity and not sub-debt. Furthermore, the exposure to tail risk does not matter for the issuance of sub-debt only when issuing banks report high regulatory capital buffers. Nevertheless, in this group of banks the issuance likelihood remains small at any level of tail risk.

In short, our tests offer further evidence of market discipline in debt quantities (Billett et al., 1998; Park and Peristiani, 1998), with risk-sensitive investors leading to a lower supply of funds to riskier banking firms, especially when they have low capital buffer. These findings are, therefore, against the view that the inclusion of sub-debt in the regulatory capital might especially appeal to banks with more risk-shifting incentives because of a lack of market discipline.

3.5.3.2 Regulatory Capital Buffer and Bank Size

Our baseline analysis, where *Size* is a strong predictor of the issuance decision, raises the possibility that the use of sub-debt to improve regulatory capital ratios is primarily, or even entirely, an option for the largest banks in our sample. If these banks are then not subject to any market discipline because of the too-big-to-fail arguments suggested by recent studies on market discipline in debt prices (see for instance, Acharya et al., 2016), they might then be inclined to build up their leverage risk via sub-debt issuance (even when they become riskier). The inclusion of sub-debt in the regulatory capital might then facilitate risk-shifting by larger banks.

[Insert Table 3-6]

To assess whether the above argument is valid, we initially extend the baseline specification with an interaction term between *Buffer* and *Size* in Table 3-6. We report the regression results in Panel A, whereas in Panel B we report the probability of issuing sub-debt and equity for small (total assets equal to the 25th percentile of the sample distribution) and large banks (total assets equal to the 75th percentile of the sample distribution) and for similar percentiles of the capital buffer. We then compare, in Panel C, whether these probabilities significantly differ between small and large banks.

We find that the issuance likelihood increases significantly in the group of large banks especially when they are characterized by a low buffer. In contrast, for small banks the likelihood to issue sub-debt is extremely low at any level of capital buffer, though it is significantly higher for banks with a lower regulatory capital buffer. In both groups, banks are more likely to opt for the issuance of equity than sub-debt at any level of the buffer (column 3). For instance, for a large bank with a low buffer, we observe an annual issuance probability equal to about 2.09% and 5.28% for sub-debt and equity, respectively. In contrast, the probability that a small bank with a low buffer issues sub-debt is only about 0.38% versus an annual probability to issue equity of 3.73%. In short, we find strong support for sub-debt being primarily used to boost regulatory capital when banks are large. However, the fact that large banks with low regulatory buffer are also significantly more likely to issue equity than other banks casts doubt on the fact that these banks design the issuance strategies around risk-shifting opportunities.

In Table 3-7 we further elaborate on the possibility that the size effect in sub-debt issuance is a consequence of large banks being perceived by investors as too-big-to-fail and as such are not penalized for their risk-taking behavior (see discussions by, Afonso et al., 2014; Bhagat et al., 2015; Hagendorff et al., 2018). In this table, we extend our baseline model with an interaction term between *Tail Risk* and *Size* to assess if large banks are not penalized by investors when they are more exposed to tail risk because of a lack of market discipline in debt quantities.

[Insert Table 3-7]

We report the regression results in Panel A and the predicted probability to issue sub-debt and equity for different values of bank size and for different tail risk exposures in Panel B. We find that large banks with a high tail risk exposure (namely, banks with tail risk equal to the 75th percentile of the sample distribution) are significantly less likely to issue sub-debt,

whereas they are more likely to issue equity. In contrast, we do not find that the risk-exposure matters for the issuance decisions of smaller banks. Taken together, these findings suggest that larger banks are subject to a disciplinary mechanism via debt quantity and are forced to recapitalize through equity issuance when they become highly exposed to tail risk. In contrast, the irrelevance of tail risk for small banks suggests the presence of broader difficulties in accessing the sub-debt market, and the security markets in general, for these banks (as compared to larger banks).

We next review if the observed market discipline in debt quantities is especially strong when issuing large banks are characterized by a low regulatory buffer; namely, for those large banks where a higher tail risk exposure is likely to be more detrimental for debtholders because of the lower equity protection against losses. To this end we estimate a model with a triple interaction term between *Size, Tail Risk* and *Buffer* (and with interaction terms between each pair of constituent components). Therefore, this model allows us to understand how the issuing behavior of large (and small) banks with different regulatory buffers is influenced by their tail risk exposure. We report the results of this interaction in Panel A of Table 3-8 while Panel B shows the predicted probabilities, and their differences, of issuing sub-debt and equity by large and small banks with low buffers across tail risk levels. Panel C reports the same statistics for large and small banks with high buffers across their tail risk (as defined earlier).

[Insert Table 3-8]

Panel A of Table 3-8 indicates that larger banks with low buffers are less likely to issue sub-debt when they are riskier, while the issuance probability of smaller banks with low buffers remains relatively low and independent of the tail risk exposure. Furthermore, the probability that larger banks issue equity is still significantly higher than the probability of issuing sub-debt at any value of tail risk. Yet, and in line with the findings reported in Table

3-5, Panel B confirms that the only setting where tail risk does not matter for the issuance decision of sub-debt is when the issuing banks are characterized by a high regulatory capital buffer. However, the lack of risk-sensitivity equally applies to small banks and large banks (with both banks showing low issuance likelihood).

All in all, our findings indicate that the issuance choices of large banks to improve regulatory capital ratios are heavily affected by market mechanisms that penalize the issuance of debt securities by riskier institutions. In particular, the fact that larger banks with a low regulatory buffer are significantly more likely to issue sub-debt when they are less risky, and the evidence of a greater likelihood to issue equity than sub-debt by these banks, go against the argument that these banks are not subject to market discipline in debt quantity which aids their risk-shifting via the issuance choices. More generally, our analysis is supportive of the presence of size benefits unrelated to government guarantees and related to the economies of scale in the issuance process of any type of security (including sub-debt and equity) when the issuer is a large corporation (Barclay and Smith, 1995).

3.6 Conclusions

The eligibility of sub-debt as a component of bank regulatory capital implies that the issuance of sub-debt is a viable option to improve a bank's regulatory capital ratio. In this study, we contrast this regulatory motive for the issuance of sub-debt with other potential explanations of the issuance decision proposed for non-financial firms. In conducting our analysis, we account for the fact that the issuance of sub-debt contributes with equity issuance to improve the capital ratio and employ a multinomial logit model to identify and compare the determinants of the two issuance decisions.

Our analysis finds that the issuance likelihood of sub-debt is primarily driven by the purpose of improving the regulatory capital ratio, with a limited additional number of

significant explanatory factors that seem to reflect easier entry conditions into the sub-debt segment of the bond market. The economic impact of these factors is, however, generally more limited as compared to the economic impact of the capital buffer.

In a set of additional tests that exploit how variation in tail risk and size influences the issuance decisions of banks with low buffers, we do not find support for the importance of risk-shifting incentives. In particular, we show that sub-debt issuance is an important tool to improve regulatory capital ratios especially for banks with low tail risk exposure, while riskier institutions are more likely to rely on equity issuance to boost their buffer. While these results are supportive of the presence of market discipline in debt quantities, we document that this discipline mechanism materializes especially for large banks, against the view that investors do not penalize these banks because of too-big-to-fail guarantees. Small banks show instead broader difficulties in accessing the sub-debt market unrelated to their tail risk exposure.

Overall, our analysis suggests that regulation is a key motivation for the decision of banks to enter the sub-debt market and shows that the inclusion of this type of debt in the regulatory capital primarily benefits safer and larger institutions because of market discipline in debt quantities and because of easier entry conditions to the security markets. Notably, by identifying systematic differences between issuers and non-issuers of sub-debt, our analysis shows the importance of accounting for selection bias in any analysis focusing on market discipline in debt prices.

Tables and Figures - Chapter 3

Table 3-1: Distribution of Sub-Debt and Seasoned Equity Offers (Equity) from 1983 to 2015

This table summarizes our sample of banks that have issued sub-debt and equity on an annual basis, the relative frequencies of the securities and average proceeds raised from both securities.

		Subordinated Debt					Seasoned Equity Offers - Equity				
Year	**Banks**	**Issuers**	**Issuers to Banks (%)**	**Issues**	**Issues to Banks (%)**	**Average Amount ($mil)**	**Issuers**	**Issuers to Banks (%)**	**Issues**	**Issues to Banks (%)**	**Average Amount ($mil)**
1983	210	3	1.4	3	1.4	256.7	0	0.0	0	0.0	0.0
1984	215	13	6.0	15	7.0	192.8	0	0.0	0	0.0	0.0
1985	226	21	9.3	27	11.9	138.8	0	0.0	0	0.0	0.0
1986	230	11	4.8	11	4.8	83.7	20	8.7	21	9.1	59.4
1987	238	24	10.1	31	13.0	244.2	3	1.3	3	1.3	117.2
1988	226	9	4.0	9	4.0	235.0	0	0.0	0	0.0	0.0
1989	227	17	7.5	17	7.5	156.8	3	1.3	3	1.3	296.7
1990	222	8	3.6	10	4.5	137.7	2	0.9	2	0.9	102.7
1991	230	14	6.1	24	10.4	135.6	14	6.1	14	6.1	84.6
1992	217	27	12.4	37	17.1	200.1	16	7.4	16	7.4	59.8
1993	773	19	2.5	29	3.8	192.7	22	2.8	23	3.0	48.0
1994	901	18	2.0	24	2.7	179.5	9	1.0	9	1.0	9.7
1995	892	20	2.2	26	2.9	164.9	10	1.1	10	1.1	24.6
1996	841	13	1.5	19	2.3	248.8	8	1.0	8	1.0	15.6
1997	795	11	1.4	16	2.0	251.4	5	0.6	5	0.6	25.7
1998	803	11	1.4	12	1.5	176.5	15	1.9	15	1.9	102.8
1999	902	10	1.1	11	1.2	380.0	9	1.0	10	1.1	187.5
2000	858	7	0.8	8	0.9	456.3	2	0.2	2	0.2	744.1
2001	834	9	1.1	10	1.2	858.6	9	1.1	10	1.2	24.8
2002	762	9	1.2	11	1.4	691.5	14	1.8	14	1.8	46.0
2003	732	17	2.3	24	3.3	374.3	15	2.0	16	2.2	154.0
2004	673	8	1.2	16	2.4	612.1	17	2.5	18	2.7	61.3
2005	705	8	1.1	13	1.8	1136.9	16	2.3	16	2.3	34.3
2006	751	5	0.7	9	1.2	2051.2	18	2.4	18	2.4	46.6
2007	708	11	1.6	13	1.8	1006.5	5	0.7	5	0.7	89.3
2008	676	7	1.0	8	1.2	1088.8	28	4.1	30	4.4	1511.1
2009	668	3	0.4	3	0.4	87.5	86	12.9	97	14.5	656.2
2010	673	2	0.3	2	0.3	22.8	73	10.8	78	11.6	198.8
2011	655	0	0.0	0	0.0	0.0	27	4.1	28	4.3	179.2
2012	675	2	0.3	1	0.1	75.0	27	4.0	28	4.1	61.6
2013	652	10	1.5	14	2.1	1124.0	29	4.4	34	5.2	33.8
2014	649	18	2.8	22	3.4	607.9	26	4.0	28	4.3	83.9
2015	623	30	4.8	37	5.9	328.2	21	3.4	24	3.9	83.3
Total	**19442**	**395**	**2.0**	**512**	**2.6**	**385.2**	**549**	**2.8**	**585**	**3.0**	**264.0**

Table 3-2: Analysis of Issuers and Non-Issuers

This table summarizes the descriptive statistics of non-security issuers, sub-debt issuers and equity issuers and their associated mean difference in Panel A. Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. Panel B classifies banks and security issues into the four quartiles of the Buffer distribution, while Panel C summarizes sub-debt issues that are eligible for inclusion in regulatory capital because they meet the minimum qualifying criteria and/or the issuer still has regulatory capacity to include the instruments within the quota for Tier 2 elements. The frequency and amount raised from these eligible securities in relation to all sub-debt issues are also reported.

Panel A: Summary Statistics of Non-security Issuers and Issuers	**Non-Issuers**			**Sub-Debt Issuers**			**Equity Issuers**			**Mean Difference**		
	N	Mean	Median	N	Mean	Median	N	Mean	Median	Non-issuers vs Sub-Debt	Non-issuers vs Equity	Sub-Debt vs Equity
Buffer	62557	0.067	0.054	512	0.037	0.037	585	0.065	0.063	0.030***	0.001	-0.029***
Size	62557	7.218	9.946	512	10.21	10.36	585	7.962	7.689	-2.997***	-0.744***	2.253***
Bank Age	60696	1.755	1.909	512	2.928	3.194	575	2.190	2.375	-1.173***	-0.435***	0.738***
ROA	61897	0.003	0.003	508	0.003	0.003	583	0.001	0.002	-0.0003**	0.001***	0.002***
Tax	62557	0.302	0.316	512	0.308	0.317	585	0.301	0.308	-0.006	0.001	0.007
Tobin's Q	52903	1.353	1.231	490	1.428	1.304	550	1.071	0.974	-0.075**	0.282***	0.357***
Tail Risk	52970	0.046	0.037	492	0.031	0.027	550	0.058	0.047	0.014***	-0.012***	-0.027***
Deposits	62017	0.766	0.785	508	0.684	0.702	583	0.764	0.778	0.083***	0.002	-0.080***
Credit Quality	62557	0.111	0.000	512	0.691	1.000	585	0.188	0.000	-0.581***	-0.077***	0.503***
TARP	62557	0.042	0.000	512	0.006	0.000	585	0.202	0.000	0.036***	-0.160***	-0.196***
Inflation	62557	0.006	0.006	512	0.007	0.007	585	0.005	0.005	-0.001*	0.001***	0.002***
Term Premium	62557	0.006	0.001	512	0.005	0.001	585	0.007	0.003	0.001	-0.001	-0.002

Panel B: Distribution of Sub-Debt and Equity Issues by Buffer Size

Buffer-Size Quartile	Number of Banks	**Sub-Debt**		**Equity**	
		Number of Issues	Issues to Banks (%)	Number of Issues	Issues to Banks (%)
1st Quartile	1060	248	23.4	194	18.3
2nd Quartile	1173	178	15.2	158	13.5
3rd Quartile	1251	72	5.8	141	11.3
4th Quartile	1121	14	1.2	92	8.24

Panel C: Eligible Sub-Debt Issues

Total Issues	Eligible Issues	Eligible Issues to Total Issues (%)	Total Amount ($mil)	Eligible Amount ($mil)	Eligible Amount to Total Amount (%)
512	307	60.0	197 242	137 581	69.8

Table 3-3: Modelling the Probability of Issuing Sub-Debt or Equity - Multinomial Logit Model

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the Chi2 (p-value in parentheses) of difference in the marginal effects of the Buffer and other factors that are significant in the sub-debt issuance model. The standard errors (in parentheses) are clustered at the bank level, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-19.23***	-16.76***	-14.89***	-14.52***	-4.338
	(3.404)		(2.595)		(4.284)
Size	0.853***	0.748***	0.320***	0.306***	0.533***
	(0.102)		(0.0531)		(0.113)
Bank Age	-0.0392	-0.031	-0.231***	-0.229***	0.192
	(0.124)		(0.0809)		(0.142)
ROA	26.24	22.99	12.10	11.66	14.14
	(22.56)		(15.00)		(26.84)
Tax	0.184	0.151	0.798	0.790	-0.615
	(0.942)		(0.616)		(1.124)
Tobin's Q	-0.0596	-0.055	0.184*	0.183*	-0.243
	(0.155)		(0.105)		(0.189)
Tail Risk	-12.20***	-10.76***	0.0180	0.186	-12.21***
	(3.444)		(2.074)		(4.087)
Deposits	-1.425	-1.271	1.017	1.030	-2.442*
	(1.135)		(0.717)		(1.374)
Credit Quality	0.246	0.212	-0.0176	-0.021	0.263
	(0.178)		(0.177)		(0.233)
TARP	0.164	0.134	0.797***	0.789***	-0.633
	(0.762)		(0.164)		(0.774)
Inflation	-3.364	-3.042	5.346	5.355	-8.710
	(6.857)		(6.892)		(9.547)
Term Premium	3.742**	3.351***	-3.558**	-3.585**	7.300***
	(1.471)		(1.448)		(2.172)
Constant	-9.697***		-8.304***		-1.393
	(1.523)		(0.845)		(1.785)
Observations	49058		49058		49058
R-squared	0.212				
Year Dummies	Yes		Yes		Yes
Panel B: Test for Difference between the Marginal Effects of Buffer and Size, Tail Risk and Term Premium - Chi2 (p-value in parentheses)					
Buffer = Size	31.60	(0.00)	30.93	(0.00)	
Buffer = Tail Risk	1.900	(0.17)	25.85	(0.00)	
Buffer = Term Premium	32.79	(0.00)	11.68	(0.00)	

Table 3-4: Probability of Issuing Sub-Debt or Equity

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panels B to E show the probability of issuing sub-debt or equity by banks at the lower quartile and those at the upper quartile of the Buffer, Size, Tail Risk and Term Premium distributions, respectively. The standard errors are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-19.23***	-16.76***	-14.89***	-14.52***	-4.338
	(3.404)		(2.595)		(4.284)
Size	0.853***	0.748***	0.320***	0.306***	0.533***
	(0.102)		(0.0531)		(0.113)
Bank Age	-0.0392	-0.031	-0.231***	-0.229***	0.192
	(0.124)		(0.0809)		(0.142)
ROA	26.24	22.99	12.10	11.66	14.14
	(22.56)		(15.00)		(26.84)
Tax	0.184	0.151	0.798	0.790	-0.615
	(0.942)		(0.616)		(1.124)
Tobin's Q	-0.0596	-0.055	0.184*	0.183*	-0.243
	(0.155)		(0.105)		(0.189)
Tail Risk	-12.20***	-10.76***	0.0180	0.186	-12.21***
	(3.444)		(2.074)		(4.087)
Deposits	-1.425	-1.271	1.017	1.030	-2.442*
	(1.135)		(0.717)		(1.374)
Credit Quality	0.246	0.212	-0.0176	-0.021	0.263
	(0.178)		(0.177)		(0.233)
TARP	0.164	0.134	0.797***	0.789***	-0.633
	(0.762)		(0.164)		(0.774)
Inflation	-3.364	-3.042	5.346	5.355	-8.710
	(6.857)		(6.892)		(9.547)
Term Premium	3.742**	3.351***	-3.558**	-3.585**	7.300***
	(1.471)		(1.448)		(2.172)
Constant	-9.697***		-8.304***		-1.393
	(1.523)		(0.845)		(1.785)
Observations	49058		49058		49058
R-squared	0.212				
Year Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer (at lower quartile) and High-Buffer Banks (at upper quartile) issuing sub-debt or equity					
A) Low-Buffer Banks	1.139***		1.472***		-0.333**
B) High-Buffer Banks	0.474***		0.724***		-0.250**
Difference in probability (B vs A)	-0.665***		-0.748***		
Panel C: Probability (%) of Small Banks (at lower quartile) and Large Banks (at upper quartile) issuing sub-debt or equity					
A) Small Banks	0.067***		0.593***		-0.526***
B) Large Banks	0.362***		1.104***		-0.742***
Difference in probability (B vs A)	0.296***		0.511***		
Panel D: Probability (%) of Low Tail Risk Banks (at lower quartile) and High Tail Risk Banks (at upper quartile) issuing sub-debt or equity					
A) Low Tail Risk Banks	1.023***		1.025***		-0.002
B) High Tail Risk Banks	0.819***		1.029***		-0.210*
Difference in probability (B vs A)	-0.204***		0.004		
Panel E: Probability (%) of issuing sub-debt or equity during Low-Premium (at lower quartile) and High-Premium Periods (at upper quartile)					
A) Low-Premium Period	0.895***		1.138***		-0.243**
B) High-Premium Period	1.062***		0.956***		0.106
Difference in probability (B vs A)	0.167***		-0.182**		

Table 3-5: Probability of Issuing Sub-Debt or Equity and Tail Risk

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B shows the probability of issuing sub-debt or equity by banks at the lower quartile (Low Tail Risk) and those at the upper quartile (High Tail Risk) of the Tail Risk distribution when their buffers are at the lower quartile (Low-Buffer) and upper quartile (High-Buffer) of the Buffer distribution. Panel C reports the associated marginal effects of Low-Buffer and High-Buffer banks when they have low and high Tail Risk. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Equity**	**(3)** **Sub-Debt vs Equity**
Buffer	-21.56***	-14.28***	-7.278
	(5.294)	(2.536)	(5.776)
Tail Risk	-15.70***	2.535	-18.24***
	(3.802)	(2.120)	(4.252)
Buffer # Tail Risk	53.28	95.77***	-42.50
	(104.0)	(25.71)	(106.2)
Size	0.863***	0.278***	0.585***
	(0.102)	(0.0510)	(0.113)
Bank Age	-0.0350	-0.0984	0.0633
	(0.125)	(0.0780)	(0.141)
ROA	27.60	-4.604	32.20
	(22.33)	(14.88)	(26.56)
Tax	0.0412	1.423**	-1.382
	(0.954)	(0.581)	(1.113)
Tobin's Q	-0.142	0.184**	-0.326**
	(0.136)	(0.0932)	(0.166)
Deposits	-1.193	1.041	-2.234
	(1.121)	(0.702)	(1.360)
Credit Quality	0.213	-0.00350	0.216
	(0.178)	(0.168)	(0.225)
TARP	-0.362	1.126***	-1.488**
	(0.619)	(0.189)	(0.643)
Inflation	-3.457	2.467	-5.924
	(6.856)	(6.782)	(9.421)
Term Premium	3.501**	-4.650***	8.151***
	(1.443)	(1.414)	(2.125)
Constant	-9.806***	-7.464***	-2.342
	(1.511)	(0.790)	(1.758)
Observations	49058	49058	49058
R-squared	0.201		
Year Dummies	Yes	Yes	Yes
Panel B: Probability (%) of Low Tail Risk and High Tail Risk Banks issuing sub-debt or equity at different levels of the Buffer			
Low Tail Risk Banks			
A) Low-Buffer Banks	1.208***	1.118***	-0.090
B) High-Buffer Banks	0.483***	0.647***	-0.164**
Difference in probabilities (B vs A)	-0.725***	-0.471***	
High Tail Risk Banks			
C) Low-Buffer Banks	0.934***	1.248***	-0.314
D) High-Buffer Banks	0.387***	0.792***	-0.405***
Difference in probabilities (D vs C)	-0.547***	-0.456***	
Panel C: High vs Low Tail Risk Banks (difference in probabilities)			
A) Low-Buffer Banks	-0.274***	0.130***	-0.144***
B) High-Buffer Banks	-0.096	0.145***	-0.049***
Marginal Effects (B vs A)	0.178***	0.015	

Table 3-6: Probability of Issuing Sub-Debt or Equity and Bank Size

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B shows the probability of issuing sub-debt or equity by banks at the lower quartile (Small) and those at the upper quartile (Large) of the Size distribution when their buffers are at the lower quartile (Low-Buffer) and upper quartile (High-Buffer) of the Buffer distribution. Panel C reports the associated marginal effects of Small and Large banks when they have low and high Buffers. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Equity**	**(3)** **Sub-Debt vs Equity**
Buffer	-20.14	-40.24***	20.10
	(15.75)	(8.182)	(17.83)
Size	0.858***	0.0607	0.798***
	(0.123)	(0.0727)	(0.139)
Buffer # Size	0.0566	3.979***	-3.923**
	(1.764)	(0.892)	(1.990)
Bank Age	-0.0326	-0.0744	0.0418
	(0.125)	(0.0792)	(0.143)
ROA	28.35	3.514	24.84
	(22.52)	(15.01)	(26.76)
Tax	0.0161	1.298**	-1.282
	(0.952)	(0.580)	(1.113)
Tobin's Q	-0.142	0.135	-0.277*
	(0.136)	(0.0941)	(0.165)
Tail Risk	-14.19***	5.700***	-19.89***
	(3.561)	(1.595)	(3.962)
Deposits	-1.214	0.752	-1.967
	(1.119)	(0.673)	(1.333)
Credit Quality	0.214	-0.00724	0.221
	(0.177)	(0.170)	(0.227)
TARP	-0.254	1.182***	-1.436**
	(0.590)	(0.189)	(0.611)
Inflation	-3.389	3.420	-6.809
	(6.879)	(6.738)	(9.395)
Term Premium	3.553**	-4.417***	7.970***
	(1.447)	(1.428)	(2.139)
Constant	-9.803***	-5.664***	-4.138**
	(1.742)	(0.886)	(1.956)
Observations	49058	49058	49058
R-squared	0.202		
Year Dummies	Yes	Yes	Yes
Panel B: Probability (%) of Small and Large Banks issuing sub-debt or equity at different levels of the Buffer			
Small Banks			
A) Low-Buffer Banks	0.095***	0.933***	-0.838***
B) High-Buffer Banks	0.035***	0.417***	-0.382***
Difference in probabilities (B vs A)	-0.060***	-0.516***	
Large Banks			
C) Low-Buffer Banks	0.523***	1.321***	-0.798***
D) High-Buffer Banks	0.197***	0.879***	-0.682***
Difference in probabilities (D vs C)	-0.326***	-0.442***	
Panel C: Large vs Small Banks (difference in probabilities)			
A) Low-Buffer Banks	0.429***	0.388***	0.041
B) High-Buffer Banks	0.162***	0.462***	-0.300***
Marginal Effects (B vs A)	-0.267***	0.074	

Table 3-7: Probability of Issuing Sub-Debt or Equity based on Size and Tail Risk

This table reports the probability of issuing sub-debt or equity by banks based on their Size and Tail Risk. The regression results in panel A are estimated with a Multinomial Logit model for the sample period 1983 to 2015 with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B shows the probability of issuing sub-debt or equity by banks at the lower quartile (Small) or those at the upper quartile (Large) of the Size distribution when their Tail Risk is at the lower quartile (Low Tail Risk) and upper quartile (High Tail Risk) of the Tail Risk distribution. Panel C reports the associated marginal effects of Small and Large banks when they have low and high Tail Risk. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Equity**	**(3)** **Sub-Debt vs Equity**
Buffer	-19.73***	-10.52***	-9.207**
	(3.509)	(1.957)	(3.977)
Size	0.891***	-0.00518	0.896***
	(0.124)	(0.0683)	(0.138)
Tail Risk	-5.146	-26.95***	21.81
	(17.31)	(5.734)	(18.20)
Size # Tail Risk	-0.910	4.094***	-5.004**
	(1.879)	(0.623)	(1.990)
Bank Age	-0.0311	-0.0613	0.0303
	(0.125)	(0.0807)	(0.143)
ROA	28.35	1.737	26.61
	(22.31)	(15.19)	(26.61)
Tax	0.00584	1.337**	-1.331
	(0.953)	(0.583)	(1.108)
Tobin's Q	-0.138	0.227**	-0.365**
	(0.136)	(0.0946)	(0.167)
Deposits	-1.209	0.850	-2.059
	(1.116)	(0.710)	(1.359)
Credit Quality	0.214	0.0653	0.149
	(0.178)	(0.173)	(0.229)
TARP	-0.196	1.112***	-1.308**
	(0.576)	(0.195)	(0.597)
Inflation	-3.294	2.562	-5.856
	(6.841)	(6.846)	(9.464)
Term Premium	3.586**	-4.876***	8.462***
	(1.441)	(1.438)	(2.139)
Constant	-10.13***	-5.279***	-4.854***
	(1.650)	(0.819)	(1.871)
Observations	49058	49058	49058
R-squared	0.204		
Year Dummies	Yes	Yes	Yes
Panel B: Probability (%) of Small and Large Banks issuing sub-debt or equity at different levels of Tail Risk			
Small Banks			
A) Low Tail Risk	0.075***	0.752***	-0.677***
B) High Tail Risk	0.060***	0.718***	-0.658***
Difference in probabilities (B vs A)	-0.015	-0.034	
Large Banks			
C) Low Tail Risk	0.415***	0.944***	-0.529***
D) High Tail Risk	0.324***	1.058***	-0.734***
Difference in probabilities (D vs C)	-0.091***	0.114***	
Panel C: Large vs Small Banks (difference in probabilities)			
A) Low Tail Risk	0.341***	0.192**	0.149
B) High Tail Risk	0.264***	0.341***	-0.077
Marginal Effects (B vs A)	-0.077***	0.149***	

Table 3-8: Probability of Issuing Sub-Debt or Equity based on Buffer, Size and Tail Risk

This table reports the probability of issuing sub-debt or equity by banks based on their Size, Tail Risk and Buffer. The regression results in panel A are estimated with a Multinomial Logit model for the sample period 1983 to 2015 with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B shows the issuance probability of Large (at the upper quartile of Size distribution) or Small banks (at the lower quartile of Size distribution) with low buffers (at the lower quartile of Buffer distribution) according to their risk levels, while Panel C reports similar probabilities when the banks have higher buffers (at the upper quartile of Buffer distribution). The standard errors are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Equity**	**(3)** **Sub-Debt vs Equity**
Buffer	-24.22	-47.61***	23.39
	(17.44)	(8.839)	(19.52)
Size	0.899***	-0.175*	1.074***
	(0.138)	(0.0960)	(0.161)
Tail Risk	-1.938	-32.85***	30.92*
	(17.26)	(6.252)	(18.44)
Buffer # Size	0.335	4.097***	-3.762*
	(1.807)	(1.054)	(2.089)
Buffer # Tail Risk	76.28	50.97	25.31
	(103.5)	(47.95)	(112.5)
Size # Tail Risk	-1.502	3.726***	-5.229***
	(1.804)	(0.685)	(1.952)
Buffer # Size # Tail Risk	0.00252	0.00612***	-0.00360***
	(0.00154)	(0.00155)	(0.00107)
Bank Age	-0.0261	-0.0496	0.0236
	(0.124)	(0.0837)	(0.145)
ROA	22.83	2.791	20.03
	(22.57)	(15.63)	(27.30)
Tax	0.0500	1.077*	-1.027
	(0.949)	(0.602)	(1.127)
Tobin's Q	-0.142	0.146	-0.288
	(0.146)	(0.103)	(0.178)
Deposits	-1.138	1.430**	-2.568*
	(1.116)	(0.726)	(1.353)
Credit Quality	0.217	-0.0439	0.261
	(0.176)	(0.176)	(0.231)
TARP	0.187	0.588***	-0.401
	(0.729)	(0.184)	(0.746)
Inflation	-4.857	-1.411	-3.446
	(6.906)	(7.020)	(9.655)
Term Premium	3.963***	-4.757***	8.720***
	(1.454)	(1.450)	(2.159)
Constant	-10.17***	-4.150***	-6.021***
	(1.841)	(0.977)	(2.065)
Observations	49058	49058	49058
R-squared	0.211		
Year Dummies	Yes	Yes	Yes

Table 3-8 (Continued): Probability of Issuing Sub-Debt or Equity based on Buffer, Size and Tail Risk

This table reports the probability of issuing sub-debt or equity by banks based on their Size, Tail Risk and Buffer. The regression results in panel A are estimated with a Multinomial Logit model for the sample period 1983 to 2015 with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B shows the issuance probability of Large (at the upper quartile of Size distribution) or Small banks (at the lower quartile of Size distribution) with low buffers (at the lower quartile of Buffer distribution) according to their risk levels, while Panel C reports similar probabilities when the banks have higher buffers (at the upper quartile of Buffer distribution). The standard errors are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1) **Sub-Debt**	**(2)** **Equity**	**(3)** **Sub-Debt vs Equity**
Panel B: Probability (%) of Small/Low-Buffer Banks and Large/High-Buffer Banks issuing sub-debt or equity at different levels of Tail Risk			
Large Banks with Low Buffers			
A) Low Tail Risk	0.571***	1.520***	-0.949***
B) High Tail Risk	0.453***	1.479***	-1.026***
Difference in probabilities (B vs A)	-0.118***	-0.041	
Small Banks with Low Buffers			
C) Low Tail Risk	0.102***	1.359***	-1.257***
D) High Tail Risk	0.086***	1.143***	-1.393***
Difference in probabilities (D vs C)	-0.016	-0.216***	
Small vs Large Low-Buffer Banks			
E) Low Tail Risk	-0.469***	-0.161	
F) High Tail Risk	-0.367***	-0.336**	
Panel C: Probability (%) of Small/High-Buffer Banks and Large/High-Buffer Banks issuing sub-debt or equity at different levels of Tail Risk			
Large Banks with High Buffers			
A) Low Tail Risk	0.220***	0.798***	-0.578***
B) High Tail Risk	0.188***	0.815***	-0.627***
Difference in probabilities (B vs A)	-0.032	0.017	
Small Banks with High Buffers			
C) Low Tail Risk	0.038***	0.474***	-0.436***
D) High Tail Risk	0.035***	0.418***	-0.383***
Difference in probabilities (D vs C)	-0.003	-0.056*	
Small vs Large High-Buffer Banks (difference in probabilities)			
E) Low Tail Risk	-0.182***	-0.324***	
F) High Tail Risk	-0.153***	-0.397***	

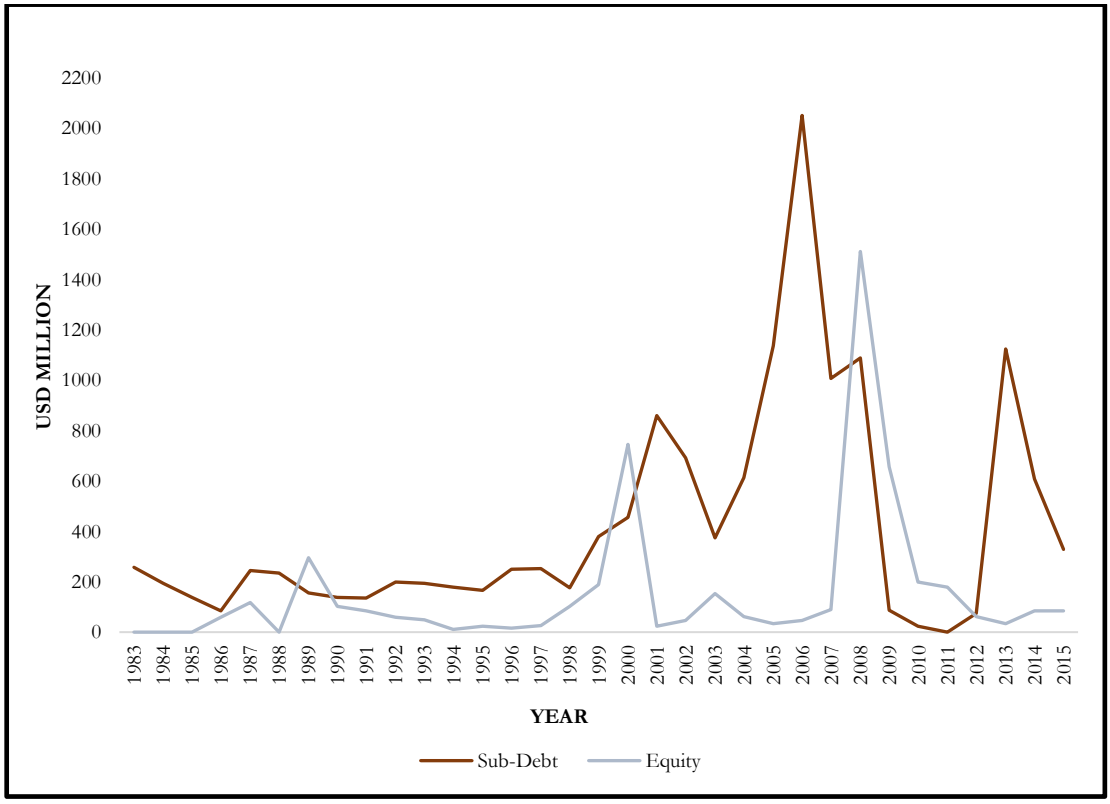

Figure 3-1: Average Proceeds from Sub-Debt and Equity

This graph presents the annual average amount raised from sub-debt and equity issues for the period 1983 to 2015.

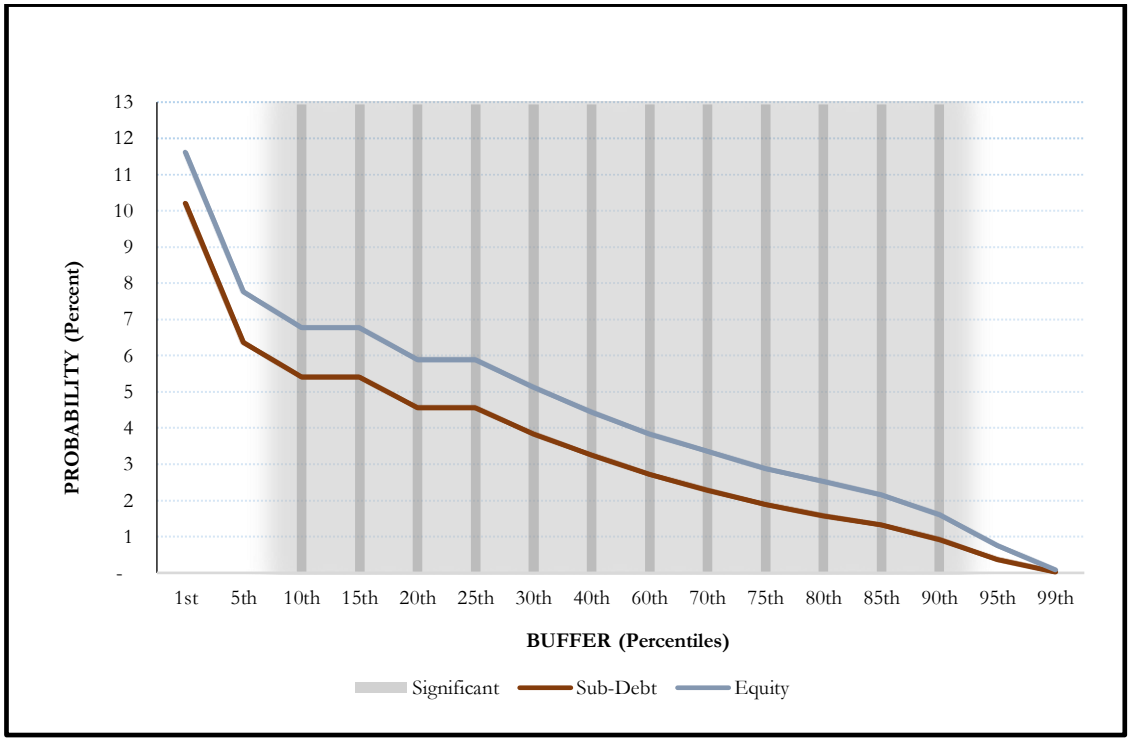

Figure 3-2: Probability (annualized) of Issuing Sub-Debt or Equity

This graph displays the annualized probability of issuing sub-debt or equity by banks at different percentiles of the Buffer, for the period 1983 to 2015. Buffer is the actual regulatory capital adequacy ratio less the minimum required. The shaded area are points where the probability to issue sub-debt is significantly different from the probability to issue equity.

Additional Tables - Chapter 3

Table A.3-1: Components of Capital and Capital Adequacy Ratios

This table summarizes the developments in regulatory capital requirements in the US. Panel A shows the composition of regulatory capital while Panel B reports the levels of bank capitalization.

	Jan 1982	Jun 1985	Mar 1989[a]
Panel A: Composition of Regulatory Capital			
Primary Capital (Tier 1)			
Common stock	√	√	√
Perpetual preferred stock (Noncumulative)	√	√	√[b]
Capital surplus (Stock premium)	√	√	√
Retained earnings	√	√	√
Mandatory convertibles	√	√	n/a
Reserves for contingencies	√	√	
Other capital reserves	√	√	
Minority interest	n/a	√	√
Allowance for loan losses	√	√	n/a
Goodwill	n/a	Deduct	Deduct
Secondary Capital (Tier 2)			
Limited life preference stock	√	√	
Qualifying subordinated debt	√	√	√
Intermediate-term preferred stock	n/a		√[c]
Allowance for loan losses			√[d]
Undisclosed after-tax profits			√
Mandatory convertibles and hybrids			√
Perpetual preferred stock (Cumulative)			√
Deductions from Total Capital (Tier 1 + Tier 2)			
Reciprocal holdings of capital	n/a		Deduct
Investments in unconsolidated subsidiaries			

Panel B: Classification of Bank Capitalization (%)					
Capital Classifications	Regional Banks	Community Banks	All Banks	Total Risk-Based Capital	Tier 1 Leverage
Well Capitalized	n/a			>= 10.0	>=5.0
Adequately Capitalized	> 6.5	> 7.0	> 7.0	>= 8.0	>=4.0
Marginally Capitalized	>= 5.5	>= 6.5	>=6.0	n/a	
Minimum Requirement	5.5	6.0	6.0	8.0	4.0
Under Capitalized	< 5.5	< 6.0	< 6.0	< 8.0	< 4.0
Significantly Undercapitalized	n/a			< 6.0	< 3.0
Critically Under-Capitalized				< 2[e]	< 2[e]
Relative to:	Total Assets (TA)		TA + ALL - Goodwill	Risk-Weighted Assets	

[a] The rules were fully implemented in January 1993, with some transition arrangements between 1990 and 1992.
[b] Limited to 25% of Tier 1 capital.
[c] Are aggregated with sub-debt and limited to 50% of Tier 1 capital.
[d] Limited to 1.25% of RWA.
[e] The threshold is relative to tangible capital, which includes regulatory capital plus cumulative preference shares.

Table A.3-2: Probability of Issuing Sub-Debt or Equity - Quarterly Time Dummies

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B to E show and compare the probability of issuing sub-debt or equity by banks at the lower quartile and those at the upper quartile of the Buffer, Size, Tail Risk, and Inflation distributions, respectively. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-21.79***	-19.03***	-8.023***	-7.640***	-13.77***
	(3.057)		(1.933)		(3.519)
Size	0.874***	0.764***	0.299***	0.284***	0.575***
	(0.100)		(0.0517)		(0.112)
Bank Age	-0.0390	-0.034	-0.0211	0.020	-0.0180
	(0.126)		(0.0799)		(0.142)
ROA	25.39	22.30	1.124	0.733	24.27
	(22.76)		(15.06)		(27.17)
Tax	0.0154	-0.001	0.951	0.944	-0.936
	(0.932)		(0.584)		(1.099)
Tobin's Q	-0.206	-0.181	0.0290	0.032	-0.235
	(0.141)		(0.0990)		(0.174)
Tail Risk	-16.20***	-14.34***	6.638***	6.838***	-22.84***
	(3.365)		(1.789)		(3.894)
Deposits	-0.921	-0.829	1.265*	1.270*	-2.186
	(1.149)		(0.712)		(1.398)
Credit Quality	0.190	0.167	-0.150	-0.146	0.340
	(0.178)		(0.170)		(0.228)
TARP	-0.760	-0.688	1.321***	1.324***	-2.081***
	(0.615)		(0.197)		(0.640)
Inflation	-16.00*	-13.49*	-37.96***	-37.47***	21.96
	(8.908)		(10.24)		(13.65)
Term Premium	3.973	3.599	-7.119***	-7.132***	11.09***
	(2.700)		(2.242)		(3.536)
Constant	-9.970***		-8.147***		-1.823
	(1.509)		(0.814)		(1.772)
Observations	49058		49058		49058
R-squared	0.203				
Quarter Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer (at low quartile) and High-Buffer Banks (at upper quartile) issuing sub-debt or equity					
A) Low-Buffer Banks	1.182***		1.220***		-0.038
B) High-Buffer Banks	0.434***		0.837***		-0.403***
Difference in probability (B vs A)	-0.747***		-0.383***		
Panel C: Probability (%) of Small Banks (at low quartile) and Large Banks (at upper quartile) issuing sub-debt or equity					
A) Small Banks	0.065***		0.616***		-0.551***
B) Large Banks	0.370***		1.101***		-0.731***
Difference in probability (B vs A)	0.305***		0.485***		
Panel D: Probability (%) of Low-Risk Banks (at low quartile) and High-Risk Banks (at upper quartile) issuing sub-debt or equity					
A) Low Tail Risk Banks	1.049***		0.878***		0.171*
B) High Tail Risk Banks	0.779***		1.004***		-0.225**
Difference in probability (B vs A)	-0.269***		0.127***		
Panel E: Probability (%) of issuing sub-debt or equity during Low-Inflation (at low quartile) and High-Inflation Period (at upper quartile)					
A) Low-Inflation Period	1.056***		1.242***		-0.186
B) High-Inflation Period	0.946***		0.929***		0.017
Difference in probability (B vs A)	-0.110***		-0.313***		

Table A.3-3a: Probability of Issuing Sub-Debt or Equity Across Regulatory Capital Regimes

This table reports the likelihood of issuing sub-debt or equity for the pre-Basel I and the Basel I regimes. The Basel regimes are categorized as Pre-Basel I in the years 1983-1989, while Basel I regime is from 1990 to 2002. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution, while Panel C compares the effect of the Buffer on security issuance across the regulatory capital regimes. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Pre-Basel I Regime (1983-1989)			**Basel I Regime (1990-2002)**		
Panel A: Regression Analysis	(1)	(2)	(3)	(4)	(5)	(6)
	Sub-Debt	Equity	Sub-Debt vs Equity	Sub-Debt	Equity	Sub-Debt vs Equity
Buffer	-24.11**	-40.39*	16.29	-17.25***	-25.71***	8.458
	(9.363)	(21.18)	(20.73)	(5.689)	(7.777)	(9.531)
Size	0.969***	0.453	0.516*	0.848***	0.0608	0.787***
	(0.133)	(0.289)	(0.283)	(0.188)	(0.0989)	(0.199)
Bank Age	-0.0263	0.0133	-0.0396	-0.0685	-0.139	0.0702
	(0.206)	(0.247)	(0.263)	(0.165)	(0.127)	(0.203)
ROA	5.972	-280.7***	286.7***	32.70	-20.03	52.73
	(31.78)	(80.39)	(77.05)	(31.13)	(34.99)	(48.89)
Tax	-1.415	3.073	-4.489*	0.217	-0.178	0.395
	(1.288)	(2.142)	(2.601)	(1.763)	(1.140)	(2.068)
Tobin's Q	0.362	0.561	-0.199	-0.0644	0.328*	-0.393
	(0.295)	(0.392)	(0.462)	(0.216)	(0.172)	(0.269)
Tail Risk	-18.08**	-57.99**	39.91	-7.436	0.193	-7.629
	(9.081)	(25.53)	(27.25)	(5.196)	(4.941)	(7.178)
Deposits	1.033	1.352	-0.319	-1.778	1.915	-3.693*
	(1.515)	(2.654)	(3.061)	(1.537)	(1.165)	(1.903)
Credit Quality	-0.193	-0.604	0.411	0.624**	0.334	0.290
	(0.223)	(0.646)	(0.651)	(0.314)	(0.392)	(0.457)
Inflation	-18.21	-26.46	8.253	1.735	-13.85	15.59
	(24.98)	(56.42)	(62.04)	(19.34)	(24.83)	(31.49)
Term Premium	-1.782	17.32***	-19.10***	5.408**	-3.320	8.728*
	(2.314)	(6.532)	(7.229)	(2.706)	(3.828)	(4.718)
Constant	-12.19***	-10.57***	-1.618	-10.79***	-6.383***	-4.405
	(1.886)	(3.479)	(3.710)	(2.543)	(1.346)	(2.818)
Observations	4422	4422	4422	21931	21931	21931
R-squared	0.165			0.262		
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity						
A) Low-Buffer Banks	2.765***	0.578***	2.187***	1.017***	0.548***	0.469***
B) High-Buffer Banks	1.972***	0.328***	1.644***	0.466***	0.154**	0.312**
Difference in probability (B vs A)	-0.793**	-0.250**		-0.551***	-0.395***	
Panel C: Comparison of the Buffer Across Regulatory Regimes						
Sub-Debt (Pre- vs Post-Basel I)				-6.860		
Equity (Pre- vs Post-Basel I)					-14.68	

Table A.3-3b: Probability of Issuing Sub-Debt or Equity Across Regulatory Capital Regimes

This table reports the likelihood of issuing sub-debt or equity for the pre-Basel I and the Basel I regimes. The Basel regimes are categorized as Pre-Basel I in the years 1983-1989, while Basel I regime is from 1990 to 2005. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution, while Panel C compares the effect of the Buffer on security issuance across the regulatory capital regimes. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Pre-Basel I Regime (1983-1989)			**Basel I Regime (1990-2005)**		
Panel A: Regression Analysis	(1)	(2)	(3)	(4)	(5)	(6)
	Sub-Debt	Equity	Sub-Debt vs Equity	Sub-Debt	Equity	Sub-Debt vs Equity
Buffer	-24.11**	-40.39*	16.29	-19.20***	-20.57***	1.365
	(9.363)	(21.18)	(20.73)	(5.338)	(6.528)	(8.488)
Size	0.969***	0.453	0.516*	0.866***	0.114	0.752***
	(0.133)	(0.289)	(0.283)	(0.162)	(0.0907)	(0.175)
Bank Age	-0.0263	0.0133	-0.0396	-0.143	-0.299**	0.157
	(0.206)	(0.247)	(0.263)	(0.158)	(0.117)	(0.193)
ROA	5.972	-280.7***	286.7***	24.31	-45.48	69.79
	(31.78)	(80.39)	(77.05)	(32.72)	(31.06)	(47.08)
Tax	-1.415	3.073	-4.489*	0.163	0.371	-0.208
	(1.288)	(2.142)	(2.601)	(1.641)	(1.258)	(2.052)
Tobin's Q	0.362	0.561	-0.199	-0.129	0.354**	-0.483**
	(0.295)	(0.392)	(0.462)	(0.194)	(0.145)	(0.237)
Tail Risk	-18.08**	-57.99**	39.91	-7.520	0.819	-8.339
	(9.081)	(25.53)	(27.25)	(5.059)	(4.707)	(6.965)
Deposits	1.033	1.352	-0.319	-1.451	0.603	-2.054
	(1.515)	(2.654)	(3.061)	(1.471)	(1.092)	(1.855)
Credit Quality	-0.193	-0.604	0.411	0.837**	0.209	0.628
	(0.223)	(0.646)	(0.651)	(0.330)	(0.344)	(0.441)
Inflation	-18.21	-26.46	8.253	12.21	2.162	10.05
	(24.98)	(56.42)	(62.04)	(11.27)	(12.58)	(16.89)
Term Premium	-1.782	17.32***	-19.10***	5.050**	-1.499	6.549*
	(2.314)	(6.532)	(7.229)	(2.348)	(2.891)	(3.745)
Constant	-12.19***	-10.57***	-1.618	-11.14***	-7.399***	-3.738
	(1.886)	(3.479)	(3.710)	(2.276)	(1.311)	(2.592)
Observations	4422	4422	4422	26838	26838	26838
R-squared	0.165			0.251		
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity						
A) Low-Buffer Banks	2.765***	0.578***	2.187***	1.046***	0.661***	0.385***
B) High-Buffer Banks	1.972***	0.328***	1.644***	0.523***	0.294***	0.229
Difference in probability (B vs A)	-0.793**	-0.250**		-0.523***	-0.367***	
Panel C: Comparison of the Buffer Across Regulatory Regimes						
Sub-Debt (Pre- vs Post-Basel I)				-4.910		
Equity (Pre- vs Post-Basel I)					-19.82	

Table A.3-4: Probability of Issuing Sub-Debt or Equity before the Global Financial Crisis - 1983 to 2006

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2006 (before the Global Financial Crisis). Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-16.70***	-17.47***	-19.93***	-11.06***	3.226
	(4.400)		(5.878)		(7.444)
Size	0.952***	1.006***	0.095	0.045	0.857***
	(0.124)		(0.087)		(0.141)
Bank Age	-0.074	-0.076	-0.224**	-0.125**	0.150
	(0.135)		(0.101)		(0.160)
ROA	22.44	24.32	-64.80**	-36.68**	87.25**
	(23.52)		(29.76)		(37.23)
Tax	-0.517	-0.553	0.800	0.455	-1.316
	(1.016)		(1.051)		(1.457)
Tobin's Q	-0.035	-0.041	0.371***	0.209	-0.406*
	(0.169)		(0.132)		(0.213)
Tail Risk	-11.33***	-11.98***	-0.350	-0.094	-10.98*
	(3.915)		(4.152)		(5.705)
Deposits	-0.674	-0.720	0.872	0.497	-1.546
	(1.270)		(1.023)		(1.681)
Credit Quality	0.311*	0.327	0.195	0.107	0.116
	(0.186)		(0.289)		(0.338)
Inflation	-0.0884	0.000	-10.32	-5.806	10.23
	(8.250)		(11.33)		(14.15)
Term Premium	2.731*	2.824*	6.970***	3.898***	-4.238
	(1.448)		(2.565)		(3.017)
Constant	-11.14***		-6.061***		-5.082**
	(1.768)		(1.093)		(2.083)
Observations	33197		33197		33197
R-squared	0.218				
Year Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity					
A) Low-Buffer Banks	1.234***		0.751***		0.483***
B) High-Buffer Banks	0.576***		0.281***		0.295*
Difference in probability (B vs A)	-0.658***		-0.469***		

Table A.3-5: Probability of Issuing Sub-Debt or Equity - 1993 to 2015

This table reports the likelihood of issuing sub-debt or equity for the sample period 1993 to 2015. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-30.99***	-19.58***	-18.27***	-18.29***	-12.72**
	(4.873)		(2.843)		(5.658)
Size	0.767***	0.485***	0.365***	0.364***	0.402***
	(0.119)		(0.0565)		(0.132)
Bank Age	-0.085	-0.050	-0.375***	-0.382***	0.289
	(0.153)		(0.0964)		(0.180)
ROA	20.47	12.79	24.35	24.62	-3.876
	(34.18)		(15.13)		(37.13)
Tax	0.915	0.580	0.382	0.380	0.533
	(1.369)		(0.698)		(1.520)
Tobin's Q	-0.149	-0.097	0.149	0.154	-0.298
	(0.175)		(0.119)		(0.213)
Tail Risk	-9.366*	-5.998*	1.228	1.364	-10.59*
	(5.032)		(2.140)		(5.558)
Deposits	-2.281*	-1.463*	0.465	0.501	-2.746*
	(1.290)		(0.783)		(1.529)
Credit Quality	0.460	0.295	-0.0490	-0.055	0.509
	(0.310)		(0.206)		(0.344)
TARP	0.235	0.141	0.799***	0.813***	-0.564
	(0.748)		(0.168)		(0.761)
Inflation	10.13	6.328	12.12*	12.25*	-1.987
	(6.944)		(6.733)		(9.395)
Term Premium	4.989**	3.238**	-4.301***	-4.451***	9.290***
	(2.269)		(1.572)		(2.834)
Constant	-7.042***		-5.978***		-1.064
	(1.785)		(0.954)		(2.086)
Observations	42509		42509		42509
R-squared	0.218				
Year Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity					
A) Low-Buffer Banks	0.949***		1.491***		-0.542***
B) High-Buffer Banks	0.227***		0.623***		-0.396***
Difference in probability (B vs A)	-0.722***		-0.867***		

Table A.3-6: Modelling the Probability of Issuing Sub-Debt, Equity or Internally Generating Capital

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Multinomial Logit regression estimates with the dependent variable as a multiple outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, 3 if a bank internally generated its capital by cutting dividends and/or reducing assets - Internal, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution. The standard errors (in parentheses) are clustered at the bank level, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1) Sub-Debt**	**(2) Marginal Effect(%)**	**(3) Equity**	**(4) Marginal Effect(%)**	**(5) Internal**	**(6) Marginal Effect(%)**	**(7) Sub-Debt vs Equity**	**(8) Sub-Debt vs Internal**
Buffer	-20.49***	-19.33***	-10.65***	-11.90***	3.021***	87.43***	-9.833**	-23.51***
	(3.195)		(2.292)		(0.314)		(3.935)	(3.189)
Size	0.876***	0.753***	0.320***	0.287***	0.0349**	0.262	0.555***	-0.841***
	(0.102)		(0.0518)		(0.0157)		(0.112)	(0.102)
Bank Age	0.0676	-0.047	-0.0761	-0.202**	0.235***	5.630***	0.144	0.167
	(0.128)		(0.0770)		(0.0216)		(0.143)	(0.128)
ROA	-12.12	20.36	-37.42**	-1.635	-66.32***	-1562***	25.30	-54.20**
	(23.46)		(15.32)		(5.184)		(27.11)	(23.31)
Tax	-0.0160	0.072	0.966	1.076*	-0.218	-5.715	-0.982	-0.202
	(0.953)		(0.619)		(0.165)		(1.123)	(0.945)
Tobin's Q	-0.155	-0.046	0.120	0.229**	-0.201***	-4.798***	-0.275	-0.0455
	(0.158)		(0.101)		(0.0369)		(0.190)	(0.160)
Tail Risk	-11.66***	-11.50***	2.694	1.501	2.518***	64.20***	-14.36***	14.18***
	(3.484)		(2.080)		(0.508)		(4.138)	(3.518)
Deposits	-1.591	-1.251	0.930	1.140	-0.362*	-8.433*	-2.521*	1.229
	(1.138)		(0.720)		(0.202)		(1.384)	(1.144)
Credit Quality	0.215	0.196	0.00629	0.011*	-0.0143	-0.443	0.208	-0.229
	(0.178)		(0.171)		(0.0640)		(0.230)	(0.186)
TARP	-0.153	-0.342	1.212***	0.987***	0.411***	9.257***	-1.366**	0.564
	(0.604)		(0.167)		(0.0641)		(0.618)	(0.605)
Inflation	-7.675	-5.186	5.585	7.594	-3.631*	-86.35**	-13.26	4.043
	(7.013)		(7.199)		(1.855)		(9.783)	(7.003)
Term Premium	3.787***	3.137**	-2.996*	-3.321**	0.544*	12.86*	6.783***	-3.244**
	(1.432)		(1.545)		(0.322)		(2.192)	(1.430)
Constant	-9.263***		-7.478***		-0.547**		-1.785	8.716***
	(1.527)		(0.817)		(0.239)		(1.775)	(1.531)
Observations	49058		49058		49058		49058	49058
R-squared	0.059							
Year Dummies	Yes		Yes		Yes		Yes	Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt, equity or internally generating capital								
A) Low-Buffer Banks	1.186***		1.366***		45.55***		-0.180	-44.36***
B) High-Buffer Banks	0.430***		0.762***		49.83***		-0.332***	-49.40***
Difference in probability (B vs A)	-0.756***		-0.604***		4.275***			

Table A.3-7a: Probability of Issuing Sub-Debt or Equity - Additional Controls

This table reports the likelihood of issuing sub-debt or equity from 1983 to 2015. The results are estimated with a Multinomial Logit regression model with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Panel A shows the regression estimates with the gross loans divided by total assets, Loans-Assets, as an additional control variable. Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panels B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-19.60***	-17.02***	-15.27***	-14.94***	-4.324
	(3.205)		(2.616)		(4.121)
Loans-Assets	0.007	0.009	-0.166	-0.165	0.173
	(0.930)		(0.600)		(1.092)
Size	0.847***	0.740***	0.320***	0.307***	0.527***
	(0.103)		(0.0544)		(0.113)
Bank Age	-0.0395	-0.031	-0.247***	-0.246***	0.208
	(0.127)		(0.0806)		(0.145)
ROA	30.46	26.59	13.17	12.69	17.29
	(21.99)		(15.13)		(26.41)
Tax	0.392	0.331	0.936	0.927	-0.544
	(0.980)		(0.640)		(1.165)
Tobin's Q	-0.0911	-0.082	0.171	0.172	-0.262
	(0.168)		(0.107)		(0.201)
Tail Risk	-11.74***	-10.33***	0.101	0.265	-11.84***
	(3.488)		(2.061)		(4.118)
Deposits	-1.539	-1.367	0.994	1.011	-2.533*
	(1.065)		(0.742)		(1.353)
Credit Quality	0.256	0.225	-0.0107	-0.014	0.267
	(0.182)		(0.177)		(0.236)
TARP	0.161	0.130	0.800***	0.794***	-0.639
	(0.763)		(0.164)		(0.775)
Inflation	-3.139	-2.836	5.474	5.496	-8.613
	(6.883)		(6.842)		(9.575)
Term Premium	3.719**	3.319**	-3.491**	-3.529**	7.210***
	(1.483)		(1.449)		(2.175)
Constant	-9.596***		-8.102***		-1.494
	(1.587)		(0.899)		(1.833)
Observations	48807		48807		48807
R-squared	0.214				
Year Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity					
A) Low-Buffer Banks	1.146***		1.496***		-0.350**
B) High-Buffer Banks	0.469***		0.722***		-0.253**
Difference in probability (B vs A)	-0.677***		-0.773***		

Table A.3-7b: Probability of Issuing Sub-Debt or Equity - Additional Controls

This table reports the likelihood of issuing sub-debt or equity from 1983 to 2015. The results are estimated with a Multinomial Logit regression model with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Panel A shows the regression estimates with Non-Performing Loans and Other Real Estate Loans as additional control variables. Non-Performing Loans is the ratio of non-performing loans to total assets, while Other Real Estate Loans is the ratio of other real estate loans to total assets. Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution. The standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-26.59***	-16.36***	-16.75***	-17.80***	-9.849
	(5.354)		(2.947)		(6.123)
Non-Performing Loans	-1101	-663.7	-2034	-2184	933.2
	(5984)		(2431)		(6433)
Other Real Estate Loans	24.11	15.02	-3.405	-3.918	27.52
	(27.66)		(11.39)		(30.05)
Size	0.843***	0.520***	0.357***	0.377***	0.485***
	(0.131)		(0.068)		(0.148)
Bank Age	-0.141	-0.084	-0.360***	-0.387***	0.219
	(0.170)		(0.106)		(0.201)
ROA	39.78	24.47	25.07	26.65	14.70
	(38.73)		(15.39)		(40.52)
Tax	1.030	0.638	0.251	0.260	0.780
	(1.575)		(0.707)		(1.701)
Tobin's Q	-0.213	-0.132	-0.084	-0.088	-0.129
	(0.174)		(0.131)		(0.221)
Tail Risk	-9.508*	-5.924*	1.526	1.743	-11.03*
	(5.630)		(2.243)		(6.173)
Deposits	-0.461	-0.302	1.521*	1.646*	-1.982
	(1.341)		(0.785)		(1.588)
Credit Quality	0.450	0.279	0.0450	0.049	0.400
	(0.347)		(0.224)		(0.384)
TARP	-0.327	-0.210	0.676***	0.732***	-1.003
	(0.857)		(0.174)		(0.863)
Inflation	3.781	2.246	10.20	10.96	-6.417
	(7.094)		(7.028)		(9.975)
Term Premium	5.160**	3.254**	-4.672***	-5.092***	9.832***
	(2.606)		(1.704)		(3.228)
Constant	-9.770***		-6.963***		-2.806
	(1.830)		(0.964)		(2.140)
Observations	36120		36120		36120
R-squared	0.205				
Year Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity					
A) Low-Buffer Banks	1.146***		1.496***		-0.350**
B) High-Buffer Banks	0.469***		0.722***		-0.253**
Difference in probability (B vs A)	-0.677***		-0.773***		

Table A.3-8: Probability of Issuing Sub-Debt or Equity - Multinomial Probit Model

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Multinomial Probit regression estimates with the dependent variable as a tripartite outcome equal to 1 if a bank has issued sub-debt in any given quarter, 2 if equity was issued, or 0 otherwise (base outcome). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution. Standard errors (in parenthesis) are clustered at the bank level while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-13.65***	-19.10***	-6.727***	-10.93***	-6.924***
	(1.895)		(1.305)		(2.241)
Size	0.490***	0.690***	0.168***	0.263***	0.321***
	(0.059)		(0.029)		(0.063)
Bank Age	-0.027	-0.032	-0.080*	-0.140*	0.0534
	(0.065)		(0.0427)		(0.0712)
ROA	21.04	30.32	-1.434	-4.095	22.48
	(14.21)		(8.974)		(16.70)
Tax	-0.056	-0.118	0.505	0.901	-0.562
	(0.537)		(0.332)		(0.608)
Tobin's Q	-0.083	-0.124	0.0789	0.146	-0.161*
	(0.084)		(0.056)		(0.098)
Tail Risk	-7.575***	-10.90***	0.441	1.341	-8.017***
	(1.934)		(1.179)		(2.226)
Deposits	-0.701	-1.051	0.615	1.144*	-1.316*
	(0.686)		(0.383)		(0.776)
Credit Quality	0.128	0.184	-0.001	-0.010	0.129
	(0.100)		(0.0974)		(0.125)
TARP	-0.123	-0.219	0.562***	1.007***	-0.686**
	(0.306)		(0.103)		(0.314)
Inflation	-4.747	-7.037	2.993	5.661	-7.740
	(4.300)		(3.837)		(5.543)
Term Premium	1.812**	2.719**	-1.605*	-2.982**	3.417***
	(0.876)		(0.831)		(1.219)
Constant	-6.102***		-5.169***		-0.933
	(0.897)		(0.440)		(0.982)
Observations	49058		49058		49058
R-squared	0.304				
Year Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity					
A) Low-Buffer Banks	1.205***		1.334***		-0.129
B) High-Buffer Banks	0.426***		0.773***		-0.347***
Difference in probability (B vs A)	-0.779***		-0.561***		

Table A.3-9: Modelling the Probability of Issuing Sub-Debt or Equity - Ordered Probit Model

This table reports the likelihood of issuing sub-debt or equity for the sample period 1983 to 2015. Panel A shows the Ordered Probit regression estimates where, under Equation 1, the dependent variable is equal to 1 if a bank has issued equity in any given quarter or 2 if sub-debt was issued. The dependent variable under Equation 2 is equal to 1 if a bank has issued sub-debt in any given quarter or 2 if equity was issued. The base outcome in both cases is 0 (nothing issued). Buffer is the actual regulatory capital adequacy ratio less the minimum required; Size is the logarithm of total assets; Bank Age is the log number of years a bank appears on Compustat (years since IPO); ROA is the ratio of pre-tax earnings to total assets; Tax is the ratio of taxes to pre-tax earnings; Tobin's Q is the market value of equity divided by its book value; Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Deposits is the ratio of total deposits to total assets; Credit Quality is a dummy variable equal to 1 for banks with a S&P rating of BBB- or better, or 0 otherwise; TARP is a dummy variable equal to 1 for the period a bank took part in the Troubled Asset Relief Program, or 0 otherwise; Inflation is the rate of change in the consumer price index; and Term Premium is the difference between the yield on the 10 year and 1 year treasury bonds. Size and Bank Age are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). Panel B reports the probability of issuing sub-debt or equity by banks at the lower quartile (Low-Buffer) and those at the upper quartile (High-Buffer) of the Buffer distribution. The standard errors (in parentheses) are clustered at the bank level, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Regression Analysis	**(1)** **Sub-Debt**	**(2)** **Marginal Effect (%)**	**(3)** **Equity**	**(4)** **Marginal Effect (%)**	**(5)** **Sub-Debt vs Equity**
Buffer	-7.220***	-16.26***	-6.711***	-16.11***	-0.509
	(0.893)		(0.887)		
Size	0.214***	0.481***	0.191***	0.458***	0.023
	(0.026)		(0.022)		
Bank Age	-0.002	-0.004	-0.0141	-0.034	0.012
	(0.0295)		(0.028)		
ROA	4.199	9.461	3.399	8.162	0.800
	(5.432)		(5.714)		
Tax	0.343	0.772	0.362	0.868	-0.019
	(0.246)		(0.222)		
Tobin's Q	0.003	0.008	0.024	0.057	-0.021
	(0.044)		(0.039)		
Tail Risk	-0.688	-1.551	-0.299	-0.717	-0.389
	(0.717)		(0.769)		
Deposits	-0.351	-0.791	-0.166	-0.397	-0.185
	(0.340)		(0.278)		
Credit Quality	0.107*	0.241*	0.094*	0.226*	0.013
	(0.056)		(0.054)		
TARP	0.270***	0.609***	0.333***	0.800***	-0.063
	(0.071)		(0.074)		
Inflation	1.216	2.740	1.682	4.039	-0.466
	(2.084)		(2.162)		
Term Premium	-0.235	-0.529	-0.563	-1.353	0.328
	(0.424)		(0.445)		
/Cut 1	3.384***		3.386***		
	(0.401)		(0.329)		
/Cut 2	3.718***		3.680***		
	(0.402)		(0.332)		
Observations	49058		49058		
R-squared	0.145		0.127		
Year Dummies	Yes		Yes		Yes
Panel B: Probability (%) of Low-Buffer and High-Buffer Banks issuing sub-debt or equity					
A) Low-Buffer Banks	1.297***		1.373***		-0.077
B) High-Buffer Banks	0.546***		0.613***		-0.067
Difference in probability (B vs A)	-0.750***		-0.761***		

Chapter 4: The Effect of Debt Priority on the Regulatory Role of Subordinated Debt

4.1 Introduction

The quest for financial stability has triggered a continuous revision of the list of securities included in bank regulatory capital. These instruments have overtime varied in form and quantity to reflect the prevailing financial stability concerns (see, BIS, 1988; 2006; 2010). In spite of these active regulatory efforts, regulatory bank capital is still challenged as inadequate or ill-composed (Bitar et al., 2018; Fullenkamp and Rochon, 2017). In particular, the inclusion of subordinated debt (sub-debt) in regulatory capital is considered flawed given its inability to support losses on an ongoing basis and its potential to incite risk-taking (Hilscher and Raviv, 2014; Schoenmaker, 2015).[21]

The consensus, therefore, seems to be that the regulatory capital frameworks are unable to curb financial stability risks in the banking sector (see, Thakor, 2014 for a summary of this debate), and the government interventions, presence of safety nets and, to some extent, the corporate governance of banks are overwhelmingly blamed for these inefficacies. For example, interventions that bail out, or create a bail-out expectation, discourage large banks from recapitalizing (Berger and Bouwman, 2013; Dinger and Vallascas, 2016). At worst, these actions drive large banks to be risky (Afonso et al., 2014; Hagendorff et al., 2018). Similarly, ill-priced deposit insurance schemes create a valuable opportunity for banks to remain under-capitalized and shift risk to the safety net (Keeley, 1989; Lambert et al., 2017), while tighter capital regulations are frustrated by owners that compensate for the opportunity cost of

[21] Among others, sub-debt is recognized in regulatory capital if it is; unsecured, uninsured, long-term, and subordinate to depositors and general creditors (Federal Reserve System, 1989; 2007; 2013).

raising more capital by increasing risk (Laeven and Levine, 2009). In sum, the extant literature traces the inability of regulation to accordingly direct the behavior of banks to external factors and thereby, absolving the internal frictions within the wider bank capital structure from any real role in this context.

In this study, we show how the broader priority structure of debt affects the effective functioning of sub-debt as a regulatory capital element by reviewing the perceptions of shareholders to the risk-shifting and wealth-expropriation opportunities associated with senior debt vis-a-vis the regulatory value of sub-debt. The plight of regulatory sub-debt, therefore, emanates from the efforts of shareholders to expropriate wealth from bondholders (Black, 1976; Jensen and Meckling, 1976). Shareholders mainly redistribute wealth from existing bondholders by issuing debt of equivalent or senior status, in the process increasing their stock value at the expense of junior debtors (Masulis, 1980; Smith and Warner, 1979). Indeed, Tang and Singer (1993) finds that the shareholders of non-financial firms maximize wealth transfer by issuing non-subordinated as opposed to subordinated debt. In this sense, the pervasive incentives brought about by the issuance of senior debt has the potential to weaken the regulatory motives for using sub-debt in the banking context.

Using sub-debt to expose the frictions that act against regulatory motivations offers us a rare opportunity to reflect on the long-standing dispute on the inclusion of this instrument in regulatory capital. That is, the persistent regulatory recognition of sub-debt in the midst of its perceived setbacks (see for example, Barrell et al., 2011; Davies, 2015) highlights a level of regulatory confidence on the instrument that may just be frustrated by the underlying agency costs, of which the priority structure of debt is a candidate.

To examine the value of risk-shifting and wealth-expropriation opportunities to shareholders, we compare the reactions of stock to the announcement of senior and sub-

debt using an event study methodology. We further understand how bank-specific factors that induce risk-shifting condition these incentives. In another setting, we explore the prevalence of these risk-shifting motives by evaluating subsequent changes in the risk profile of banks that issued either security. For this purpose, we use a sample of US listed and delisted banks for the period January 1983 to December 2015. This longer period aids a thorough understanding of the incompatibilities in the perceptions of regulators and investors about the use of sub-debt across time-varying capital frameworks that differently treated the instrument in regulatory capital i.e., pre-Basel I to Basel III.[22] Meanwhile, the beginning of the sample period coincides with the application of the capital requirements to all banks, including multinational banks (Keeley, 1988).

We begin our analysis by examining the distribution of senior and sub-debt offers across the years, the characteristics of banks that announce the securities, and the differences between the securities announced. The preliminary analysis indicates that senior debt issues are more frequent but are concentrated within a few banks as compared to sub-debt. We also find that banks announcing senior and sub-debt are different in many respects. Nonetheless, the influence of *Bank-Size* on senior debt issues, coupled with their concentrated nature, chimes with suggestions that large and "well known" issuers face lower security flotation costs (Blackwell and Kidwell, 1988; Kwast et al., 1999). The significantly better quality of senior debt offers also attest to this claim. Other notable differences are with respect to the lower *Buffer* of banks that announce sub-debt and the longer *Maturity* of these offers, which potentially reflect the importance of regulatory motives in the announcement of sub-debt. That is, banks that offer sub-debt recognize the need to improve

[22] Effective Basel I, capital frameworks recognized a larger portion of sub-debt in regulatory capital (see, Federal Reserve System, 1989; 2007).

their capital adequacy ratio, especially with long-dated offers that can easily meet the regulatory requirements. However, banks that announce senior debt are characterized by higher agency costs as reflected by their significantly higher *Tail Risk, Tobin's Q*, *Free-Cash Flow* and the average amount raised. Additionally, senior debt offers are prevalent during unfavorable times. These periods generally present opportunities for risk-shifting owing to subdued creditor-discipline (Berger and Turk-Ariss, 2015; Hett and Schmidt, 2017). Overall, senior debt offers seem to be explained by factors that define high agency costs and to some extent, easier entry to markets, while sub-debt securities appear to fill a regulatory need.

Next, we examine the extent of value generated by the potential agency costs associated with senior debt against the regulatory effects of sub-debt by observing the reaction of shareholders to the announcement of either security. Through an event study, covering the day of announcement and a day before [-1,0], we show that, despite the regulatory benefit of sub-debt, senior debt creates significantly more value for shareholders as compared to sub-debt. In line with prior evidence from banking studies, bank shareholders do not seem to react to sub-debt offers (also see, Laderman, 1994; Wall and Peterson, 1991). We show in various tests that these results are not driven by the length of the event window nor sub-debt issues that would not offer any regulatory benefit.[23]

To further clarify our results, we divide the sample into banks that need to raise regulatory capital, viz., less-capitalized banks, and observe the shareholder reaction when these banks announce the regulatory instrument - sub-debt - or senior debt. We define less-capitalized banks as those with a regulatory capital buffer (total capital adequacy ratio less the minimum required) below the median of the sample distribution. Against regulatory expectations,

[23] We identify 102 sub-debt offers that do not meet the criteria for inclusion in Tier 2 capital and/or the bank had exceeded its regulatory Tier 2 quota prior to security announcement.

senior debt offers made by less-capitalized banks create significantly more shareholder value as compared to sub-debt. An analysis within security types also indicates that senior debt offers by less-capitalized banks are significantly more favored than those of well-capitalized banks. There is no variation, however, in the reaction of shareholders to sub-debt announcements across bank capitalization, implying that sub-debt offers, like equity, have similar information content regardless of regulation (Keeley, 1989; Krishnan et al., 2010). These results are robust to alternative classifications of bank capitalization i.e., where we make comparison of banks in the extreme quartiles of the buffer distribution. The tendency of less-capitalized bank's shareholders to favorably value senior debt instead of capital-improving elements gives the impression that banks remain under-capitalized in order to shift risk to other stakeholders (Hovakimian and Kane, 2000; Marcus, 1984). Basically, bank shareholders seem to value the risk-shifting and wealth-expropriation opportunities presented by senior debt more than the regulatory motives of sub-debt. In this manner, the perverse incentives associated with using senior debt override the regulatory incentives for using sub-debt.

To consolidate the understanding of these shareholder motives, we further examine specific channels through which banks with a high risk load can potentially shift it to the safety net or other security classes (sub-debt in this case). For this purpose we define risk as *Tail Risk*, the (minus) average equity loss when a bank's returns are in the lower 5^{th} percentile of the quarterly distribution of its daily stock returns, and our banks are classified as less-risky if their tail risk falls below the median of the sample distribution, otherwise they are defined as being risky.

We first show that shareholders of risky banks react significantly more positively to the announcement of senior debt than sub-debt - against a reasonable expectation that these banks would be better off with a capital element, given its loss-absorption capabilities. In

contrast, the market reaction of less-risky banks are not different across the securities. Nonetheless, we note that within securities, senior debt offers by risky banks create significantly more shareholder value as compared to less-risky ones. We interpret this pattern as an indication of the considerable value placed on avenues that aid shareholders to advance their risk-shifting motives. This behavior also shows up in risky and large or less-capitalized banks, as their shareholders significantly value senior debt over sub-debt offers and over senior debt offers of less-risky banks. The fact that this variation is lacking in small or well-capitalized banks suggest that opportunities for risk-shifting incentives by shareholders underlie the use of senior debt in large and less-capitalized banks and these incentives outweigh the motivations of regulatory capital frameworks that seek to encourage recapitalization and risk-reduction through sub-debt.

Our results also prevail in a multivariate setting that includes other control variables and uses the 2-day cumulative announcement return as the dependent variable. Generally, *Tail Risk* positively explains the announcement returns of senior debt but this is not the case for sub-debt offers. Over the sub-samples, announcement returns are positively associated with *Tail Risk* for senior debt offers of large or less-capitalized banks as highlighted in the univariate analysis. Likewise, we do not observe any impact of *Tail Risk* for senior offers of small or well-capitalized banks, nor do we find a significantly positive influence of *Tail Risk* on the sub-debt offers by banks of any size or capitalization level.

A possible counter-argument to our findings is that the regulatory equity ratio (also known as leverage ratio), which prescribes that total assets should be funded by at least 3% of equity and its related components potentially restrain the debt structure decisions of banks.[24] In this

[24] However, the minimum equity ratio of 3% only applies to banks that attained a composite rating of 1 in the recent onsite inspection, otherwise all other banks should maintain a ratio of 4% (see, Federal Reserve System, 1992; 2007).

regard, opportunities to use senior debt in ways that maximize the risk-shifting and wealth-expropriation incentives of shareholders may be more limited than we suppose. However, these arguments contradict our results which show that banks announcing senior or sub-debt maintain an average *Equity Ratio* over 7% (at least 4% above the requirement for some banks) and hence would be less restrained to advance the hazardous interests of shareholders through senior debt.

In addition, banks that announce senior or sub-debt are indistinguishable based on the *Equity Ratio*, which gives us some reasonable expectation that the discrepancies in the reaction of shareholders to either security could be traceable to the innate incentives related to senior or sub-debt, rather than the dynamics of the equity ratio. Furthermore, the multivariate analysis reveals that the *Equity Ratio* is irrelevant to the stock returns of banks that announce senior debt while it is inconclusive for sub-debt announcements. On these grounds, the constraints placed by the regulatory equity ratio seem to be trivial to the findings that shareholders greatly value the opportunities to shift risk or expropriate wealth from other stakeholders through the use of senior debt.

Our findings could equally be challenged by views that sub-debt specific conflicts, instead of the vice incentives from senior debt, are responsible for its own regulatory inefficacy. Such arguments would hold if shareholders, particularly of less-risky banks, consider the disciplinary attributes of sub-debt as a hindrance to their future risk-taking actions (see for example, Nguyen, 2013; Zhang et al., 2014). Also, sub-debt could reduce future debt capacity thereby limiting shareholders' ability to exploit the value-enhancing opportunities presented by senior debt. Accordingly, shareholders would not value the announcement of sub-debt if these disincentives are stronger than the regulatory motives of the instrument.

However, our indication that the announcement returns for sub-debt are independent of the riskiness of a bank goes against the "flight from discipline" arguments. Similarly, the

relatively high *Equity Ratio* of banks announcing either security does not suggest that the debt capacity of banks would be constrained in ways that could prevent shareholders from advancing their future interests with debt. In this regard, the disincentives for using sub-debt appear to be generally weak to override the regulatory incentives of the instrument, and as such, the attitudes of shareholders towards sub-debt seem to be driven mainly by the wealth-expropriation and risk-shifting opportunities presented by senior debt.

To offer some conclusive evidence on these risk-shifting motivations, we demonstrate in further tests that, after industry adjustments, senior debt issuers become significantly riskier than sub-debt issuers across the 2-year period following issuance. We conclude that the inefficacy of sub-debt as a regulatory capital element owes less to its form or design in the capital framework, but it is impaired by the priority of debt within the wider bank capital structure as shareholders value the moral hazard incentives presented by the use of senior debt over the regulatory role of sub-debt. Our findings, therefore, expand the scope of prior discussions on the capital structure and risk behavior of banks, which so far do not account for the importance of the seniority of capital instruments on the effectiveness (or otherwise) of regulatory capital frameworks (see for example, Berger et al., 2008; Dinger and Vallascas, 2016; Gropp and Heider, 2010; Memmel and Raupach, 2010).

In this regard, we offer the first examination of the implications of incentives associated with the broader priority structure of bank capital on the effectiveness of regulatory capital frameworks that recognize subordinated securities as capital elements. Prior analysis of the choice of sub-debt or senior debt in banking is, generally, limited to the information content of these securities. For example, Hancock and Birchler (2004) indicate that the co-existence of the securities in the capital structure serves the heterogeneous information needs and complexity of investors. In essence, sub-debt and senior debt are information-complements, where sub-debt is issued to satisfy the sophisticated and informed investors that are able to

bear its additional risk, while the safer senior debt serves the conservative and less informed investors.[25] However, such a focus does not bring forth the tensions that exist between these security classes to the detriment of regulatory intentions as we do in this current study.

Another study by Schandlbauer (2014) presents sub-debt and senior debt as alternative securities that banks can apply within their capital structure decisions. In their analysis, the instruments are mere liability components that do not aid banks to revert to the targets of their primary capital ratios. Essentially, the study does not emphasize on the agency costs of senior debt. Also, using sub-debt to explain primary capital ratios undermines the regulatory importance of sub-debt since the instrument does not contribute to these components of regulatory capital.

Our study directly contributes to the literature on the valuation effects of sub-debt offers (Keeley, 1989; Laderman, 1994; Wall and Peterson, 1991). Crucially, these studies pre-date Basel I and, therefore, they miss the evolving role of sub-debt in regulatory capital. Other than that, these studies are limited by sample size, with sub-debt observations ranging from just 6 to 63 offers. More importantly, they do not compare the valuation of incentives associated with senior debt to the regulatory value of sub-debt. By the same token, we complement studies that observe the valuation effects of other regulatory capital elements like equity, regulatory capital adjustments and Tier 2 capital in general (Cornett et al., 1998; Cornett and Tehranian, 1994; Krishnan et al., 2010; Li et al., 2016; Lubberink and Willett, 2016; Polonchek et al., 1989).

The rest of the study is organized as follows. Section 4.2 reviews the literature, while Section 4.3 describes the data. Section 4.4 discusses the econometric model and variables.

[25] In this case, banks tend to issue sub-debt when they have positive information to reveal to the market (Covitz and Harrison, 2004).

Section 4.5 presents the empirical results for the short-term valuation effects, while Section 4.6 discusses the post-issuance risk behavior of senior and sub-debt issuers. Section 4.7 concludes the analysis.

4.2 Related Research

Firms raise capital in many ways but the most common financial decisions are the issuance of debt or equity. While the reasons underlying debt and equity issuance decisions are likely to be similar (i.e., a need for funding) the information content of these decisions is perceived differently by the market due to the information asymmetries between firms and investors (Autore and Kovacs, 2010; Bayless and Chaplinsky, 1991; Myers and Majluf, 1984). In this regard, investors have been shown to perceive the issuance of securities as an exploitation of their valuation errors and hence they react adversely to these capital structure decisions (Bayless and Chaplinsky, 1996; McLaughlin et al., 1998a; Mikkelson and Partch, 1986).

For banks, however, the information content of security issuances, mainly equity, is debatable as some suggest that regulatory motivations dilute the over-valuation concerns of these actions, resulting in less negative wealth effects as compared to non-banks (Li et al., 2016; Polonchek et al., 1989). Moreover, Cornett and Tehranian (1994) and Cornett et al. (1998) argue that these regulatory effects are stronger for under-capitalized banks as their need for capital is well understood by the market. However, more recent evidence by Krishnan et al. (2010) finds that regulation is not binding, and the value implications of equity issues are similar regardless of bank capitalization levels.

In spite of the diverging opinions on the effect of regulation, these studies commonly find that shareholders consider equity issues as value-destructive. In essence, the market and regulatory expectations on the issuance of capital elements are incompatible and these

disparities inform views that regulation is ineffective and inadequate to restrain financial instability (Admati et al., 2013; Hellwig, 2010).

In this study we test the sources of these inadequacies using a capital instrument whose inclusion in regulatory capital is under serious dispute i.e., sub-debt. Contrary to financial stability expectations, sub-debt is considered pervasive and lacks capital attributes due to its deferred loss-absorbing capacities (Davies, 2015; Schoenmaker, 2015). Nevertheless, like equity, the perennial recognition of sub-debt in regulatory capital, despite these setbacks, underscores the regulatory confidence in the role of the instrument in financial stability that are possibly distorted by frictions in capital markets, particularly the risk-shifting and wealth-expropriation incentives of shareholders.

The plausibility of these incentives arises from the tendency of shareholders to shift risk and expropriate wealth from outstanding debtholders. Jensen and Meckling (1976) suggest that, in a capital structure that includes risky debt, shareholders substitute safer assets with risky ones to prop up their value, in the process shifting risk and expropriating the wealth of existing debtholders. More specifically, the presence of junior debt provides even stronger incentives for these moral hazards, given the ability of shareholders to increase their value through the issuance of senior debt or debt of equivalent-status as the outstanding one (Black and Cox, 1976; Jensen and Smith Jr, 1985). Shareholders effectively devalue outstanding junior debt by issuing senior debt or equivalent-status debt (Masulis, 1980). Since the risk premium or yield of a bond partially depends on the proportion of debt-to-firm value (see, Merton, 1974), leverage-increasing actions raise the yield with a consequent reduction on the value of existing bonds, and these value-effects are most severe for unprotected junior claims while share value rises (Black and Scholes, 1973). In line with these wealth-expropriation incentives, Tang and Singer (1993) finds that the stock reactions to the announcement of

non-subordinated debt are positive while subordinated debt offers, which provide limited wealth-transfer opportunities, trigger significantly negative stock reactions.

In essence, the agency costs that arise from the use of senior debt to advance the wealth-expropriation and risk-shifting incentives of shareholders potentially undermine the regulatory benefits of junior debt in bank capital. Under these circumstances, objective regulatory intentions that continue to recognize sub-debt in bank capital, and the capital frameworks in general, would be rendered ineffective or flawed in upholding financial stability, as is the current view (see, for example, Barrell et al., 2011; Fullenkamp and Rochon, 2017).

In spite of these well-documented shareholder-debtholder conflicts, the sources of regulatory inefficacies are limited to the external interventions such as government rescues and safety nets, with little regard to the internally generated tensions in the priority of securities within the wider bank capital structure. The tendency of governments to provide rescue packages for large banks incite them to be risky (Hagendorff et al., 2018; Taleb and Tapiero, 2010), and encourage them to remain under-capitalized as they await bail-out, in the process undermining the regulatory effect (Berger and Bouwman, 2013; Dinger and Vallascas, 2016). In the same way, deposit insurance presents a valuable option for banks to remain under-capitalized and shift their risk to the safety net (Furlong and Keeley, 1989; Lambert et al., 2017; Marcus, 1984). In a study that attributes regulatory distortions to corporate governance, Laeven and Levine (2009) finds that powerful owners circumvent the effectiveness of tighter capital requirements by increasing risk. Overall, the discussions about the inefficacy of regulation do not refer to the potential interferences from incentives associated with the seniority of debt in the wider capital structure of a bank.

Moreover, the extant discussions on bank capital structure so far omit the influence of debt type on the post-issuance behavior of banks despite the evidence that security issuance

decisions shape the long-term performance of firms (see among others, Lee and Loughran, 1998; Loughran and Ritter, 1995; 1997; McLaughlin et al., 1998a). For example, there is an established trend for firms issuing equity (initial public offerings or seasoned equity offerings) to underperform the benchmarks in the post-issuance period (Cornett et al., 1998; Jain and Kini, 1994; Jegadeesh, 2000; McLaughlin et al., 1996). This adverse performance is usually traced to managerial and/or investor over-optimism at issuance, which gradually subsides as more information becomes available (Gombola and Marciukaityte, 2007; Spiess and Affleck-Graves, 1995). Investors also underreact to the initial information content of debt but their subsequent revaluations results in significant post-issue stock underperformance (Datta et al., 2000b; Spiess and Affleck-Graves, 1999). McLaughlin et al. (1998b) and Lewis et al. (2001) further show that this poor post-issue performance is not only common in straight securities since convertible debt issuers also suffer a similar fate in spite of the theory that the hybrid nature of this security offers some incentives for efficient investment decisions.

Notably, capital structure decisions not only influence post-issue stock or operating performance but they also alter the long-term risk profile of issuers. Specifically, equity and convertible debt issuers assume more risk in the post-issuance period (Healy and Palepu, 1990; Lewis et al., 2002). This post-issuance risk trend, alongside the tendency of shareholders to shift risk to junior debt through senior debt, could be of immense interest to ongoing bank regulators' attempts to influence the capital structure and risk behavior of banks. In essence, understanding how the security choice decisions of banks shape their long-term risk profile would inform us of the inherent incentives within the broader bank capital structure that contradict the financial stability efforts of regulators.

Exploring the effect of the underlying risk-shifting and wealth-expropriation incentives related to senior debt on the effectiveness of the regulatory role of sub-debt, therefore, extends the scope of prior discussions on the capital structure and risk behavior of banks,

which so far do not account for the importance of the seniority of capital instruments on the effectiveness (or otherwise) of regulatory capital frameworks (see for example, Dinger and Vallascas, 2016; Gropp and Heider, 2010; Memmel and Raupach, 2010; Teixeira et al., 2014).

4.3 Data

The sample of banks used in our analysis is drawn from the population of 2145 publicly traded and delisted US banks available in Compustat-Capital IQ for the period ranging from January 1, 1983 to December 31, 2015. More precisely, we retain from Compustat firms with SIC codes from 6020 to 6036. We draw the list of senior and sub-debt offers from Thomson One Banker and Bloomberg. In both security datasets we drop issues without crucial information such as filing dates, cusip or amount. We proceed by combining the separate security datasets and merge the resulting dataset to our filtered population of Compustat-Banks (using the Cusip identifier), where we subsequently drop issuers without accounting data. The screening process up to this stage results in 545 sub-debt and 1100 senior debt offers announced by 151 and 56 banks, respectively.

Our sampling exercise proceeds by dropping joint security announcements and issuances, across and within securities, made in the event window.[26] This filtering ensures that the information content from a particular security announcement is uncontaminated by other capital decisions. At this point, we account for the possibility that equity, as an alternative capital structure decision, is also likely to distort the information content of our main securities' analysis. We, therefore, exclude senior or sub-debt offers that coincide with equity announcements or issuances within the event window. For this purpose, we draw a sample of Seasoned Equity Offers (SEOs) from Thomson One Banker over the sample period,

[26] We use the filling date as the security announcement date.

which reduces to 668 equity announcements by 385 banks with accounting information and announcement dates.[27] Our final filter retains offers that have stock information in the Centre for Research in Security Prices (CRSP) and sufficient observations in the event and estimation windows, resulting in a final sample of 310 sub-debt and 363 senior debt issues by 116 and 40 banks, respectively.[28] Table 4-1 shows the distribution of this sample over our study period.

[Insert Table 4-1]

The distribution of securities in Table 4-1 highlights some patterns and clustering across senior and sub-debt offers. There are more senior debt than sub-debt offers in our sample, but more intriguing is that there are few banks offering senior debt than sub-debt as indicated by the issuers-to-banks ratio of 0.3 and 0.8, respectively. This pattern, coupled with a relatively high senior debt issues-to-banks ratio, suggests that banks that announce senior debt are serial issuers, and potentially bear lower issuance costs associated with being known to the market (Kwast et al., 1999). The frequency distribution of both securities appears to be driven by two major regulatory or legislative interventions across our sample period, viz., the announcements of risk-based capital requirements in 1989 and depositor preference laws in 1993. For sub-debt, the risk-based capital framework that was effected in 1990 allowed a larger fraction of it in regulatory capital than previously (see, Federal Reserve System, 1985a; 1989), which potentially spurred the use of the instrument between 1989 and the full implementation period of 1993. During this period, an unprecedented number of banks came to the market and raised more issues than any time in our sample period. Notably, the

[27] We exclude pure secondary offers as they do not ultimately alter the capital structure of a bank, but their proceeds just flow between investors.

[28] The additional Table A.4-1 describes our sampling criteria for the short-term analysis.

average amount raised from these issues remained stable around this period, ranging between $114 million and $174 million.

In terms of the number of senior debt offers, they increase from 1994 but temporarily drop in 1998. However, this rally is not complemented by a rise in the number of issuers nor issuance proceeds, particularly between 1994 and 1997. These disparities are potentially driven by the introduction of depositor preference laws in 1993, which established a clear superiority of depositors over unsecured claims regardless of seniority.[29] Given that bank liabilities are generally unsecured (see, Marino and Bennett, 1999), senior debt investors could have withheld their funds in anticipation of the prospective losses upon them, hence a decline in issuers and amounts raised for the 4-year period post the enactment of the new legislation.

Overall, more proceeds were raised through senior debt, a total of $145 billion, as compared to $96 billion from sub-debt but for both securities; the latter half of the sample period accounts for most funding as depicted by the distribution of proceeds in Figure 4-1.

[Insert Figure 4-1]

4.4 Econometric Model and Variables

4.4.1 Short-Term Univariate Test

To assess the value of the risk-shifting and wealth-expropriation opportunities that act against the regulatory motives, we observe the reaction of shareholders to the announcement of a regulatory capital element, sub-debt, and towards senior debt, an instrument renowned

[29] The Omnibus Budget Reconciliation Act of 1993 pronounce that the claims of depositors have preference over claims of uninsured/unsecured creditors during the resolution of a failed FDIC insured bank. The salient features and implications of this legislation are discussed, among others, by Kaufman (1997) and Marino and Bennett (1999).

for shifting risk and expropriating the wealth of junior debt holders. We posit that shareholders that treasure these risk-shifting and wealth-expropriation opportunities will disregard the regulatory value of sub-debt and positively react to the announcement of senior debt. To reveal these stockholder incentives, we use a standard event-study methodology that applies the market return model. Our model parameters are estimated over 100 days, starting 20 days after the issuance date as a way to eliminate the upward stock return biases that are normally associated with pre-announcement, announcement or issuance periods (Cornett and Tehranian, 1994; Krishnan et al., 2010). The value-weighted CRSP index return is used as the proxy for the market return and we include its lags and leads to account for nonsynchronous trading (Scholes and Williams, 1977). More specifically, the abnormal return of bank *i* at event date *t* (AR_{it}) is given as:

$$AR_{it} = R_{it} - \left[\alpha_i + \beta_1 R_{m,t-2} + \beta_2 R_{m,t-1} + \beta_3 R_{m,t} + \beta_4 R_{m,t+1} + \beta_5 R_{m,t+2} + \varepsilon_{it}\right] \quad (2)$$

Where R_{it} is the return on security *i* on day *t;* $R_{m,t}$ is the return on the CRSP value-weighted index at time *t*, along with its lags and leads. The market model parameters (β_{1-5}) are estimated over the 100-day [20,120] post-issuance window. Our main event date is the 2-day period beginning a day before and ending on the announcement day [-1,0]. The length of this window accommodates any information leakages prior to the official announcement, while also brief enough to filter out other bank events unassociated with the security announcement. Nevertheless, we use a 3-day event window [-1,1] as an alternative specification to the main test window. The abnormal returns across the event window are summed up, and we test for the null hypothesis that the cumulative abnormal return (CAR) is equal to zero using an ordinary regression with robust standard errors. The *p-value* of the constant of this regression is the significance of the CAR. We also run a quantile (median) regression, also with robust standard errors, as an alternative test. We compare the average

differences across the sub-samples using the mean-difference test while the non-parametric Wilcoxon rank-sum test compares the medians.

For robustness tests, we estimate the abnormal return (AR_{it}) for the respective event windows using the Fama-French 3-Factor model of the form:

$$AR_{it} = R_{it} - [R_{ft} + \beta_1(R_{mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t] \quad (3)$$

Where R_{it} is the return on security *i* on day *t;* R_{ft} is the risk-free rate of return and R_{mt} is the return on the market index on day *t*. SMB_t is the excess return of small over big firms and HML_t is the excess return of high- over low-growth firms, on day *t*. The market model parameters (β_{1-3}) are estimated over the same 100-day [20,120] post-issuance period. We extract the factor loadings for the model from the Kenneth French Data Library (Fama-French 3 Factors).

Having established the value perceptions of stockholders, and the imminent conflicts between regulatory and shareholder interests, our analysis explores conditions under which the wealth-expropriation and risk-shifting incentives of shareholders are aggravated. The noted tendency of shareholders to shift risk and expropriate the wealth of junior debtholders through the use of debt of a higher priority or equivalent status suggest that shareholders of riskier banks would be more receptive to senior debt as it offers them an opportunity to offload their risky positions. In the process, these incentives may overshadow the regulatory effort of improving financial stability through lower-priority elements such as sub-debt. To measure bank risk, we use **Tail Risk**, defined by Acerbi and Tasche (2002) as the (minus) average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. We identify risky banks as those whose *Tail Risk*, in the quarter prior to the security announcement, is greater or equal to the median of the sample distribution.

Given the vulnerability of already risky banks, we proceed to test for conducive bank-specific conditions that prime shareholders to defy the regulatory forces to recapitalize but expect to shift their risk position to the tax payers or safety nets. In particular, the expectations for a bail-out provides large banks with little incentive for recapitalizing (Berger and Bouwman, 2013; Dinger and Vallascas, 2016) and incites them to be risky (Afonso et al., 2014; Hagendorff et al., 2018). Additionally, deposit insurance presents an opportunity for poorly capitalized banks to shift risk to the safety net (Hovakimian and Kane, 2000; Lambert et al., 2017). For these banks, recapitalization devalues the deposit insurance guarantee, hence shareholders enhance their wealth through higher risk-taking in a bid to expropriate the safety net (Furlong and Keeley, 1989; Keeley, 1989). In this sense, the risk-shifting motives that are already prevalent in risky banks would be more pronounced when banks are also "risky and large" or "risky and less-capitalized". As such, shareholders of these banks are more likely to react negatively to the announcement of capital-improving elements, i.e., sub-debt, that would reduce the value of their implicit government guarantee and deposit insurance guarantee. On the other hand, shareholders of "risky and large" or "risky and less-capitalized" banks could positively react to the announcement of senior instruments that do not threaten the value of their guarantees, but continue to offer opportunities for risk-shifting and wealth-expropriation.

We identify large banks as those with assets greater or equal to the median of the sample distribution, or otherwise are defined as being small. In terms of capitalization, we use the distribution of the buffer to classify banks as less- or well-capitalized. We measure the buffer as the difference between a bank's regulatory capital adequacy ratio and the minimum

required.[30] Banks with a ratio below the median of the sample distribution are considered less-capitalized. Similar to tail risk, these classifications are measured a quarter before security announcement. Overall, this analysis attempts to highlight channels through which the opportunities for risk-shifting and wealth-expropriation that come along with the use of senior debt affects the regulatory effectiveness of sub-debt.

4.4.2 Short-Term Multivariate Test

To consolidate the foregoing univariate analysis, we proceed by modelling the relationship between the stock returns and the risk of banks announcing senior or sub-debt while controlling for other factors that could condition shareholder-reaction to these offers. For this analysis, we run a multivariate regression with the *CAR* as the dependent variable and include *Tail Risk* as our main independent variable of interest. If shareholders possess strong incentives to exploit the moral hazard opportunities presented by senior debt, then *Tail Risk* should positively explain the *CAR* for senior debt announcements, and especially for large or less-capitalized banks. We highlight this relationship through an ordinary least squares specification, with standard errors that are robust to heteroscedasticity, of the form:

$$CAR_i = \alpha + \beta_1 Risk_i + \beta_2 X_i + \varepsilon_i \quad (4)$$

Where, CAR_i is the average cumulative abnormal return over the event window [-1,0] for bank *i*; $Risk_i$ is the *Tail Risk* as previously defined and measured and ε_i is the error term, which is assumed to be normally distributed with a constant variance, $\varepsilon_i \sim N(0, \sigma)$. X_i is a

[30] We use the capital ratios available in Compustat to compute the regulatory buffer. In case of missing ratios, i.e. before 1993, we compute the capital adequacy ratio as the total regulatory capital divided by total assets. For this purpose, we determine the regulatory capital elements in line with the Federal Reserve Bulletins and Krishnan et al. (2010). In addition, the unavailability of risk-weighted assets in the Basel I transition period (1990 to 1992) forces us to calculate the capital ratios during this period using the prior capital framework (regulatory capital divided by total assets). This affects only 69 issues (10% of total offers) and are, therefore, likely to have a negligible impact on our results.

vector of control variables that are also likely to condition shareholders' reaction to the announcement of debt. Most importantly, we include a number of indicators to control for time-varying macro-economic and banking conditions.[31]

The controls include the extent of bank capitalization as measured by the (**Buffer**). The impact of bank capitalization on shareholders' reaction to security announcements depends on their motivations. Investors that seek to expropriate and shift risk are less likely to recapitalize (Marcus, 1984), hence they are more likely to react negatively to capital instruments but favor pure leverage-increasing offers i.e., senior debt. Alternatively, investors keen on preserving the bank's franchise value will most likely favor regulatory securities that attenuate bank risk and react adversely to leverage-increasing securities. We also include the logarithm of bank assets (**Bank-Size**) as a control. The larger number of analysts following large firms ensures that information production and dissemination for these firms is higher (Atiase, 1985; Chae, 2005). Essentially, these firms face lower information asymmetry costs as the information content of their issues is well understood, resulting in a less negative reaction to their securities announcements (see, Li et al., 2016).

We next control for logarithm of the amount issued (**Issue-Size)**. Relatively large issues would increase the cash available under the control of management and hence exacerbate the agency costs of debt (Jensen, 1986). Also, a larger than anticipated issuance may signal lower expected cash flows (Miller and Rock, 1985). Shareholders are, therefore, more likely to react adversely to relatively large amount of new financing (Johnson, 1995). Furthermore, we control for the expected loss and recoverability rates of bonds as implied in their credit ratings (**Debt Quality**). Highly-rated debt securities are associated with positive

[31] Continuous variables are winsorized at the 1% and 99% level to minimize outlier effects.

announcement returns due to their relatively low expected loss rates or high recoverability rates (Howton et al., 1998). We define high quality securities as those with an S&P rating of BBB- or better (investment grade), or otherwise they are classified as low quality. In addition, we control for the maturity structure of debt via the logarithm of the years to maturity (**Maturity**). Flannery (1986) argues that, under information asymmetry, firms are able to signal their quality through the maturity structure of debt. Firms that are able to endure the uncertainty of reissuing debt at short intervals are ably showing-off their credibility to uninformed investors. On the contrary, bad quality firms reduce the uncertainties with regard to their refinancing rates by issuing long-term debt. An effective signal from the maturity structure of debt should, therefore, lead to an inverse relation between debt maturity and announcement returns (also see, Chen and Stock, 2018; Datta et al., 2000a).

We also control for the availability of investment opportunities (**Tobin's Q**), which we measure as the market value of equity divided by its book value. Given the tendency of shareholders to underinvest when investments partially benefit debtholders, firms with high growth opportunities will be constrained by the presence of debt in their capital structure (Myers, 1977). In this sense, shareholders should react adversely to debt announcements by growth firms (Howton et al., 1998). Similarly, leverage encourages firms to undertake suboptimal investment decisions. As the amount of debt in a firm's balance sheet rises, along with bankruptcy risk, shareholders will derive more value from debtholders by increasing the volatility of the firm (Jensen and Meckling, 1976). With these asset-substitution incentives, shareholders would react positively to debt announcements by highly leveraged institutions (Howton et al., 1998). We measure the extent of this indebtedness as the fraction of primary or Tier 1 capital to total assets (**Equity Ratio**), where a lower ratio denotes excessive leverage.

The availability of cash under the control of managers (**Free-Cash Flow**) and the effect of the tax shield (**Tax**) associated with debt are also likely to condition shareholder reactions. When the cash available exceeds the value of profitable investment opportunities, self-servicing managers are more likely to engage in sub-optimal investment activities at the expense of shareholders (Jensen, 1986). Effectively, shareholders would react adversely to debt announcements by firms that have a high level of existing cash (Howton et al., 1998). We measure **Free-Cash Flow** as operating cash divided by total assets. On the other hand, the tax-deductibility of interest payments offers a valuable tax shield to investors (De Mooij and Keen, 2016; Heider and Ljungqvist, 2015; Schandlbauer, 2017). The announcement of debt, regardless of priority, is therefore likely to be associated with positive stock returns. Our **Tax** variable is measured as the ratio of taxes to pre-tax earnings.

Lastly, we control for the time-varying conditions in the economy and banking sector, in particular. We account for the effect of the broader economic conditions on the supply and demand of capital securities by including an economic cycle indicator (**Recession**). The variable takes the value of 1 for recessions as reported by the National Bureau of Economic Research (NBER), or otherwise 0. Among others, Choe et al. (1993) and Dutordoir and Van de Gucht (2007) show that shareholder reactions to security issuance are conditional on the state of the economy. In particular, shareholders are more receptive to debt announcements made during economic upswings (Krishnaswami and Yaman, 2007).

For the banking industry specific conditions, we include the aggregate level of systemic risk - Marginal Expected Shortfall (**MES**), Banking Crisis periods (**Crisis**) and the Dodd-Frank Era (**Dodd-Frank**) as time-control variables. We measure **MES** as the (minus) average equity loss when market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns (see, Acharya et al., 2017). This variable captures an institution's contribution to overall systemic risk and higher values suggest a larger

contribution. In line with the broader macroeconomic conditions, shareholders are more likely to react adversely to debt announcements during periods of high systemic risk. Similarly, shareholders could be less receptive to debt announcements during a crisis, as is the case with equity announcements made at these times (see, Li et al., 2016). We define **Crisis** in line with Liu and Ngo (2014), where banking crisis periods include the Savings and Loan crisis (1986Q1 to 1992Q4) and the global financial crisis (2007Q3 to 2009Q4). The variable takes the value of 1 for these crisis periods, or otherwise 0. We further include a dummy variable equal to 1 for all periods from the effective implementation of the Dodd-Frank Act in July 2010 (**Dodd-Frank**), or otherwise 0. The period captures the increasing scrutiny of regulators on banks, which reduced information asymmetries and resultantly lowered adverse selection costs for security issuances (see, Li et al., 2016). Effectively, stock returns are more likely to be positive to debt announcements made in the Dodd-Frank era.

4.4.3 Long-Term Multivariate Test

The findings that capital structure decisions tend to alter the long-term risk behavior of issuers (see, Healy and Palepu, 1990; Lewis et al., 2002) suggest that the security choice decision plays a significant role in the post-issuance risk profile of an institution. For debt priority in particular, the risk-shifting incentives related to the use of senior debt imply that institutions that issue senior debt would be riskier in the post-issue period. In similar ways, the intentions to shift risk would show up if banks that were already risky, but went ahead with the issuance, become riskier after the issuance of senior debt. On the other hand, banks that subsequently issue sub-debt are expected to be risk-averse partly due to the cushion that the instrument provides as a regulatory capital component and/or its presumptive disciplinary ability (Nguyen, 2013; Zhang et al., 2014).

This final test, therefore, seeks to establish if there is some association between bank security choice and bank risk post-issuance. In more precise terms, we test if the issuance of

senior debt causes banks to be risky in the long-run and whether such security choice exhibits some risk-shifting motivations that potentially undermine the intentions of regulatory capital requirements and financial stability goals at large. For this test, we require issuers to have at least 4 quarters of pre-issuance data and 8 quarters of post-issuance data of the risk indicator. Essentially, we drop issues made in 1983 and after 2013 to accommodate this sample requirement. We further drop cross-security issues made during the test period in order to have a precise impact of the security issuance decision on risk performance, *Tail Risk* in this case. In similar terms as the short-term analysis, we account for possible distortions of equity issuance on the performance of banks by excluding senior and sub-debt issues that coincide with equity issues within the test period. This screening process results in a sample of 211 sub-debt and 383 senior debt issues, respectively made by 106 and 98 banks.[32]

Conducting this analysis also requires that we account for the pre-issuance risk by matching security issuers against their peers. For our purpose, we identify the peers as the sub-sample of either security issuer in the post-issuance period. For example, a dataset of senior issuers in the test period (1st quarter to the 8th quarter after issuance) is used as a control group or peers for the 211 sub-debt issuers. Reciprocally, a dataset of sub-debt issuers in the test period is used as a control group for the 383 senior debt issuers in this analysis. We then proceed as per the recommendations of Barber and Lyon (1996) and match banks based on their pre-issuance size and operating performance. In this case, we classify security issuers into quartiles based on the distribution of assets and tail risk in the quarter before issuance, where assets and tail risk are as previously defined. We, thereafter, match sub-debt

[32] A logical expectation is that observations in the short-term analysis would exceed long-term ones, which is not the case with our senior debt offers. This anomaly is due to a short-term data constraint that requires offers to have a filing date, and the majority of senior debt offers do not meet this condition. For long-term analysis, however, the condition is irrelevant as we deal with actual issuances instead of announcements. Table A.4-2 presents the sampling criteria for the long-term analysis.

and senior debt issuers within the same quartile. In principle, this matching process is in line with decile-matching by Li et al. (2016), but our wider matching range generates a larger sample size for reasonable comparison and inference. Nevertheless, we still present the results of the tighter match (decile- and quintile-matching) to ensure robustness of our findings.

Our quartile-matching process generates matched samples of 106 and 187 sub-debt and senior debt issues, respectively.[33] Following the successful matching, we generate the 1-year pre-issuance median tail risk for either security issuers and use it to adjust the post-issuance tail risk of issuers. Basically, we obtain the adjusted tail risk of a sub-debt issuer by subtracting the median tail risk of a matching senior debt issuer, in the year prior to issuance of sub-debt, from the median tail risk of a sub-debt issuer. Reciprocally, the adjusted median risk for a senior debt issuer subtracts the prior-year median tail risk of a matching sub-debt issuer. These adjustments eliminate the pre-issuance performance bias that could spill into the post-issuance period (see, Powell and Stark, 2005).

With these adjusted measures, we test for the null hypothesis that adjusted post-issuance risk is equal to zero using an ordinary regression with standard errors corrected for heteroscedasticity. The *p-value* of the constant of this regression is the significance of the adjusted-risk. A quantile regression, also with robust standard errors, provides us with alternative median test. We assess the average differences across the sub-samples using the mean-difference test while the non-parametric Wilcoxon rank-sum test compares the medians.

[33] We obtain 87 sub-debt and 175 senior debt issues through the quintile-matching while decile process gives just 54 and 112 sub-debt and senior debt issues, respectively.

We further run a multivariate analysis to account for other factors that could influence the post-issuance risk. Under this setting, we run a linear regression model where, the adjusted post-issuance median tail risk is regressed on the adjusted 1-year pre-issuance tail risk and some control variables. In this way, the average post-issuance performance left unexplained would be attributable to the respective issuance of senior or sub-debt and would be captured by the intercept (also see, Ghosh, 2001; Powell and Stark, 2005). The model is of the form:

$$AdRisk_i^{Post} = \alpha + AdRisk_i^{Pre} + \beta X_i + \varepsilon_i \quad (5)$$

Where $AdRisk_i^{Post}$ is the adjusted post-issuance median tail risk and $AdRisk_i^{Pre}$ is the adjusted 1-year pre-issuance median tail risk. The model is run with robust standard errors, and the error term, ε_i, is assumed to be normally distributed with a constant variance, $\varepsilon_i \sim N(0, \sigma)$. X_i is a vector of control variables that are also likely to have an impact on post-issuance tail risk. Among these, we control for (**Bank-Size**), as previously defined. The inclusion of this variable is based on arguments that the implicit and explicit government guarantee of large institutions makes them unusually risky (Bhagat et al., 2015; Taleb and Tapiero, 2010). Next, we control for a bank's profitability through the Return on Assets (**ROA**), measured as pre-tax income divided by total assets. The ability of banks to build capital reserves through earnings enables them to withstand shocks. Profitable banks would, therefore, be relatively stable and less risky.

Given the credit risk inherent in banks' lending business, we control for the loan portfolio as the fraction of total loans to total assets (**Loans-Assets**). Other things equal, a large portfolio of loans denotes a higher level of risk, particularly credit risk, due to the higher risk-weight accorded to lending activities (BIS, 1988; 2006; 2010). Notwithstanding that, the risk-sensitivity of regulatory capital dictates banks hold capital commensurate with their level of risk. We, therefore, control for a bank's ability to match its risk profile via capital reserves by

including **Buffer** - as previously defined. It is then conceivable that risky banks would maintain high regulatory capital buffers. However, the effect of the buffer on bank risk is ambiguous given that poorly-capitalized banks may become riskier as shareholders attempt to shift the impending costs of failure to the safety net (Furlong and Keeley, 1989). Similarly, institutions with a low level of equity in their capital structure, thus highly levered, are more likely to get riskier in an attempt to shift risk to other stakeholders and the safety net. We capture the extent of bank indebtedness through the **Equity Ratio** - as already defined in the preceding sub-section.

In addition, we control for the charter value of a bank via **Tobin's Q**, where low values indicate a less valuable charter and more opportunities for risk-shifting (Goyal, 2005). As the charter value diminishes, value-maximizing shareholders engage in risky bets to increase the value of the deposit insurance option (Keeley, 1990; Marcus, 1984). Furthermore, we control for the issuer's credit quality (**Credit Quality**) by including a dummy variable equal to 1 for banks with a S&P rating of BBB- or better (investment grade), or 0 otherwise. Highly-rated banks have relatively lower default risk, hence they are likely to have lower tail risk.

Similar to short term analysis we account for changes in macroeconomic and banking sector conditions by including the variables, **Recession** and **Marginal Expected Shortfall** (**MES)**. The variables are as previously defined and capture the time-varying effects of the economic cycle and bank-wide systemic risk on individual bank risk. Economic contractions and periods of high-systemic risk are more likely to drive up bank risk.

4.5 The Short-Term Valuation Effects of Senior and Sub-Debt

4.5.1 Summary Statistics

Table 4-2 summarizes the characteristics of banks that announce senior and sub-debt and the differences in the offers announced.

[Insert Table 4-2]

The characteristics of banks that announce senior or sub-debt and the offer-characteristics are different in most respects. Most notably, banks that announce senior debt are larger and the offers are of a higher-credit quality than sub-debt. The significance of these indicators, alongside the concentration of the offers within a few "well-known" players (see Table 4-1), suggest that banks that announce senior debt enjoy relatively easier and cheaper access to the debt markets (Blackwell and Kidwell, 1988; Colla et al., 2013; Kwast et al., 1999). In other aspects, banks that announce sub-debt are relatively lowly capitalized (based on their *Buffer* levels) but the offers have a longer *Maturity* as compared to senior debt. This pattern could be indicative that sub-debt offers are announced with underlying regulatory considerations. That is, banks with low capital buffers derive a potential regulatory benefit in using sub-debt, especially if the instrument is more likely to meet the regulatory requirements i.e. long-dated instruments.[34] This presumption is further strengthened by the fact that the majority of sub-debt offers (67%) are compliant with the minimum maturity and the security/guarantee requirements for inclusion of sub-debt in regulatory capital and the banks still have the regulatory capacity to issue Tier 2 elements.

Senior debt offers seem to be driven by situations of high agency costs. For example, banks that announce senior debt have a relatively higher *Tail Risk,* in line with suggestions of asset-substitution in firms that have debt in their capital structure (Jensen and Meckling, 1976). In addition, senior debt offers are prevalent in banks that have high investment opportunities, *Tobin's Q*, thus prone to suboptimal investment decisions brought by leverage

[34] To be eligible for inclusion in regulatory capital, sub-debt should, among others, have a minimum original maturity of 5 years (7 years before Basel I), be subordinate to depositors and general creditors, unsecured, unguaranteed, uninsured, and should be within the required Tier 2 threshold (see, Federal Reserve System, 1985a; 1989; 2007; 2013).

(Barclay and Smith, 1995; Myers, 1977). Also, senior debt offers raise relatively higher proceeds and are common in banks that have larger *Free-Cash Flow*, which exacerbate the self-servicing interests of managers (Jensen, 1986).

Apart from these bank-specific indicators, the dominance of senior debt in *Recession* and high systemic risk periods (*MES*) suggest some systematic decision to time adverse conditions for senior debt announcements. These periods usually present opportunities for risk-shifting due to subdued creditor-discipline (Berger and Turk-Ariss, 2015; Hett and Schmidt, 2017; Karas et al., 2013). While a similar tendency may apply to sub-debt offers that dominate banking crisis periods (*Crisis*), we cannot rule out that sub-debt offers around this time potentially underlie the pronounced role of capital in periods of systemic distress (Berger and Bouwman, 2013). Therefore, the timing effect of sub-debt offers is a bit more ambiguous than the pattern exhibited by senior debt announcements.

With respect to other variables, tax considerations appear to be important for senior debt while, unsurprisingly, sub-debt offers are common in a period that witnessed an unprecedented level of scrutiny of regulatory capital levels - the Dodd-Frank era. Generally, senior debt offers seem to be explained by elements of high agency costs and, to some extent, opportunities for easier access to debt markets while sub-debt offers appear to fill a regulatory need.

4.5.2 Univariate Analysis

We test the reaction of shareholders to senior and sub-debt offers in the following univariate analysis. The tests evaluate if there are some systematic differences in stock reactions to the securities and whether these valuation differences are driven by risk-shifting and wealth-expropriation opportunities presented by the use of senior debt.

4.5.2.1 The Announcement Effects of Senior and Sub-Debt

Table 4-3 summarizes the announcement period abnormal stock returns for senior and sub-debt offers over two main event windows, [-1,0] and [-1,1]. The results in the first 3 columns are estimated through the market model while the latter 3 columns present estimates based on the 3-factor model. The standard errors are robust to heteroscedasticity in both cases.

[Insert Table 4-3]

The results in Table 4-3 indicate that shareholders react in a significantly positive manner to announcements of senior debt and the reactions are significantly different in compassion to sub-debt offers. More precisely, reactions to sub-debt offers are generally muted in line with the prior literature (see, Keeley, 1989; Laderman, 1994; Wall and Peterson, 1991). The consistency across different return-model estimations suggest that our results are robust to model specification. Also, the length of the event window does not drive these results.[35] We also show that the variations in the reaction between senior and sub-debt are not overly influenced by sub-debt that is not eligible for regulatory purposes, which have a pure leverage-effect. Table A.4-4 reports the results that exclude offers that do not meet the minimum criteria for inclusion in regulatory capital and those from banks that have already exceeded their Tier 2 regulatory capacity.[36] The results indicate that shareholders are still unreactive to sub-debt announcements while senior debt offers continue to earn a significantly positive shareholder value.

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[35] In the results reported as additional tables, Table A.4-3 shows that shareholder valuation effects of senior debt announcements still significantly outclass those of sub-debt in windows of up to 7 days [-3,3].

[36] We identify 34 sub-debt offers that do not meet the maturity and security criteria, 62 are made by banks that have already exhausted their Tier 2 regulatory threshold, and 6 are jointly disqualified and over the Tier 2 threshold.

In principle, our results are aligned to findings from non-financial firms, which show that shareholders positively value the announcement of non-subordinated offers that accord them an opportunity to advance their risk-shifting and wealth-expropriation motives (Tang and Singer, 1993). These moral hazards could be interfering with the regulatory signal resulting in a muted response to the announcement of bank regulatory capital elements, sub-debt in this case. Resultantly, the issuance of regulatory capital elements may be perceived to hold little regulatory information content (Keeley, 1989; Krishnan et al., 2010) or the whole capital framework may be deemed ineffective in directing bank behavior, particularly with the inclusion of sub-debt in regulatory capital (Barrell et al., 2011; Davies, 2015; Schoenmaker, 2015).

Bearing in mind the potential distractions on the regulatory value of sub-debt by senior debt, we proceed to test the shareholders' reactions to differently capitalized banks announcing these securities.

4.5.2.2 Do Shareholders Value the Regulatory Benefit of Sub-Debt

Under a clear regulatory signal, banks that need to raise their regulatory capital would be attractive to shareholders if they announce a capital-improving element, otherwise the opportunities for moral hazard incentives related to senior debt would prove more valuable to the detriment of regulatory intentions. In fact, under-capitalized banks that do not find the prospect of recapitalization appealing could be seeing an opportunity to shift risk to the ultimate bearers of bank losses upon failure, mainly sub-debt, or the deposit insurance (Hovakimian and Kane, 2000; Marcus, 1984). For this test we divide the sample into less- or well-capitalized banks based on their buffer distribution a quarter before announcement, where banks with a buffer below the median of the sample distribution are deemed less-capitalized, otherwise they are classified as well-capitalized. Table 4-4 presents the results of shareholder reactions to differently capitalized banks and shows that shareholders of less-

capitalized banks react in a significantly positive manner to the announcement of a non-regulatory element, senior debt, but are unreactive to the announcement of a capital-improving element, sub-debt.

[Insert Table 4-4]

The results further indicate that the reactions are only significantly different between senior and sub-debt announcements of less-capitalized banks, while the difference for well-capitalized banks is inconclusive, or at best weakly favors senior debt (column 6). More strikingly, within security analysis indicates that shareholders react in a more significantly positive way to senior debt offers by less-capitalized banks than senior offers of well-capitalized banks (column 8) but are indifferent to sub-debt offers across bank capitalization levels (column 7). Likewise, these results are unaffected by sub-debt offers that would not count towards regulatory capital, since an analysis that excludes them yields similar findings (see, additional Table A.4-5). We also eliminate the possibility that these results are driven by our bank-capitalization cut-off point by choosing a different categorizing level. In this case we categorize banks with buffers within the lower quartile of the sample distribution as capital-constrained and those within the upper quartile as unconstrained. We show the stock reactions to these banks' offers in Table 4-5.

[Insert Table 4-5]

The results in Table 4-5 are consistent with those of less-capitalized banks and offer more conclusive evidence that senior debt offers create significant share value for banks that are closer to the regulatory threshold than sub-debt. These offers are also significantly more positive than those made by unconstrained banks (column 8). In contrast, share valuations from sub-debt offers do not depend on the level of bank capitalization (column 7) and the reactions between senior and sub-debt of unconstrained banks are not different (column 5).

Clearly, there is a systematic tendency of shareholders of banks with low buffers to shun capital securities. Essentially, shareholder and regulatory expectations are incompatible in as far as the benefit of sub-debt on the stability of banks is concerned. Specifically, shareholders appear to not value the regulatory gain from the announcement and potential issuance of sub-debt in ways similar to equity (Cornett and Tehranian, 1994; Krishnan et al., 2010). In our case, it appears that this anomaly stems from the use of senior debt, as shareholders seem to treasure the risk-shifting and wealth expropriation opportunities presented by the instrument ahead of the regulatory welfare of sub-debt. In this context, our next analysis tests for the presence of these pervasive incentives within the broader capital structure of banks.

4.5.2.3 Shareholder's Risk-Shifting Incentives

Based on arguments that shareholders improve their wealth by increasing risk, we establish if the issuance of leverage-increasing instruments such as senior debt is of valuable interest to shareholders. This analysis, therefore, tests suggestions by among others, Masulis (1980), that the use of senior debt is perceived in a positive light by institutions that are risky. Arguments that expectations for bailouts become more valuable as banks grow larger (see, for example, Berger and Bouwman, 2013), also direct us to evaluate the reactions of shareholders to security announcements by large banks. To circumvent the problem of simultaneity with the issuance decision, as in earlier categorizations, we classify risky and large banks based on the respective distribution of the tail risk and assets a quarter prior to announcement of the offers.

4.5.2.4 Security-Announcements and Bank Risk

Table 4-6 reports the announcement period abnormal stock returns for senior and sub-debt offers made by risky and less-risky banks. Less-risky banks are those with a tail risk below the median of the sample distribution, otherwise they are classified as risky.

[Insert Table 4-6]

Table 4-6 indicates that shareholders react in a significantly positive way to the announcement of senior debt offers by risky banks. This reaction is significantly different to sub-debt announcements by risky banks or senior debt announcements by less-risky banks. A potential alternative argument for the preference of senior over sub-debt by risky banks lies with ideas that senior debt is cheaper for firms under or close to distress (see, Attaoui and Poncet, 2013; Hackbarth and Mauer, 2012). However, if the type of security is the underlying driver of the cost differential, then senior debt should be cheaper across the board, and shareholders would still value this cost-advantage regardless of risk levels. Strikingly, our results do not show this consistency, but shareholders are indifferent about their wealth effects when less-risky banks announce either senior or sub-debt (column 6). The failure by shareholders to positively value the announcement of a regulatory capital-instrument that could abate their risk position is even more surprising. This behavioral pattern suggest that shareholders see the use of senior debt as a value-enhancing opportunity in line with their risk-shifting and wealth-expropriation motives (Black and Scholes, 1973; Jensen and Smith Jr, 1985; Masulis, 1980).

4.5.2.5 Security-Announcements and Bank-Size

To understand the value of risk-shifting opportunities arising from the expectation of being bailed-out, we show shareholder reactions to the announcement of senior and sub-debt by small and large banks in Table 4-7.

[Insert Table 4-7]

Table 4-7 shows that shareholders of large banks significantly value the announcement of senior debt more than sub-debt. Strikingly, these valuation differences are not evident, or are at best weak, in regards to small banks (column 6). In addition, shareholders are

indifferent to the announcement of sub-debt by large or small banks (column 7), but the announcement of senior debt by large banks, to some degree, creates significant shareholder value than senior debt announced by small banks (column 8). Based on these results, we infer that the persistent share value generated by securities that have no regulatory benefit, i.e. senior debt, by large-bank shareholders perhaps explain the tendency of these banks to be undercapitalized (Berger and Bouwman, 2013; Dinger and Vallascas, 2016). Moreover, these results, alongside those of the prior sub-section, suggest that shareholder's reaction to the announcement of bank securities, particularly senior debt, are driven by bank risk and size. Therefore, we proceed to test how the interactions of risk and size conditions the reaction of stock to security announcements, and whether these factors underlie motivations for less-capitalized banks' shareholders to favor senior but non-regulatory instruments at the expense of subordinated regulatory capital elements.

4.5.2.6 Risk and Bank-Size

Hryckiewicz (2014) argues that public bail-outs destabilize the banking system in general but the risk effects are most pronounced in large banks that bet on their chances of being bailed-out (Afonso et al., 2014; Hagendorff et al., 2018). These effects are usually enabled by the reduction in creditor-discipline, which is conditioned upon the expectations of large banks to be bailed out (Acharya et al., 2016). In essence, large and risky banks could offer shareholders a conducive environment to shift risk or expropriate the wealth of other stakeholders, and the use of senior debt, as a tool that further enhances these incentives, would prove valuable to shareholders of such banks. We show the reactions of shareholders to senior and sub-debt announcements made by these banks in Table 4-8.

[Insert Table 4-8]

The results in Table 4-8 indicate that shareholders react in significantly positive way to the announcement of senior debt by large and risky banks as compared to sub-debt offers

by the same kind of banks. These reactions are in stark contrast to offers made by less-risky and large banks, where shareholders react in a significantly negative way to their senior offers. The wealth losses from these senior offers are in some cases (window [-1,1]) significantly less than those from sub-debt announcements. Meanwhile, senior debt offers by risky and large banks attract significantly more positive reactions than senior debt offers of their less-risky counterparts (column 8), while sub-debt offers are not different across the risk categories (column 7).

We further show in additional Table A.4-6 that these results are not driven by the purported cost-advantages of senior debt given that shareholders are unreactive to either security offers by risky and small banks. If anything, shareholders are happier with senior debt offers by less-risky and small banks as compared to sub-debt, in contrast to their reactions when banks are risky and large. Furthermore, shareholders' reactions to senior offers by risky and small banks relative to less-risky and small banks is significantly different and negative, as compared to the positive differential noted for large banks. To this point, it is clear that senior debt creates more shareholder value for risky and large banks while the shareholder-value perceptions of sub-debt are irreconcilable with the regulatory expectations of the instrument.

4.5.2.7 Risk and Bank-Capitalization

Arguably, the bail-out expectation attached to large banks incites them to remain under-capitalized (Berger and Bouwman, 2013; Dinger and Vallascas, 2016). These prospects may obscure the regulatory value of capital instruments, resulting in the preceding muted shareholder reaction to sub-debt announcements. On these grounds, we conduct a more direct test on the reaction of shareholders to senior or sub-debt offers by banks that need to raise their regulatory capital (they are less-capitalized) across varying levels of bank risk. We

show these results in Table 4-9 and find that shareholders of less-capitalized and risky banks attach no value to the announcement of a capital-improving element, viz., sub-debt.

[Insert Table 4-9]

The results in Table 4-9 further indicate that senior debt offers add significant value to shareholders when banks are less-capitalized and risky. These valuation effects are significantly different from sub-debt offers made by similar banks (column 3), or senior debt offers made by less-risky banks (column 8). Shareholders rather see the announcement of senior debt by less-risky banks as value-destructive in some instances (column 5). To offer a complete picture on this behavior, we test if this preference for senior debt exists in risky banks that, however, have little need for capital - namely, well-capitalized banks. The results in the additional Table A.4-7 suggest that, unlike less-capitalized banks, shareholders of well-capitalized banks do not value the announcement of senior or sub-debt irrespective of bank risk.

These results, and those before, offer some indication that regulatory capital elements are discretionary regardless of bank capital as found by Krishnan et al. (2010). However, the foregoing evidence of a consistently positive reaction to the announcement of senior debt, even by vulnerable banks, suggest that this instrument causes banks to deviate from the regulatory expectations of recapitalizing with sub-debt. In fact, the level of shareholder value generated by this non-regulatory element, especially for risky and less-capitalized banks, links well with suggestions that banks get riskier and remain under-capitalized to maximize their deposit insurance guarantee (Lambert et al., 2017; Marcus, 1984). More specifically, the attraction of senior debt offers to shareholders of banks that are already weak, by risk or capital levels, perfectly fits arguments that the instrument presents valuable opportunities for expropriating the wealth of and shifting risk to subordinated debt holders (Masulis, 1980; Tang and Singer, 1993). In the following analysis, we evaluate if this behavior persists under

a multivariate setting that controls for factors that could also condition shareholder reactions to debt offerings.

4.5.3 Multivariate Analysis

Under this section, we establish if risk level (*Tail Risk*) explains the cumulative abnormal return (*CAR*) of senior and sub-debt offers through an ordinary least squares specification. For this test, we estimate the models separately for each sub-sample and compare the statistical significance of the differences in the coefficients across groups. In this manner, the coefficients and standard errors would be consistent across the group of senior and sub-debt announcements (see, Hoetker, 2007). We find this procedure appropriate for our analyses instead of capturing the differences between the two groups through the differential intercept coefficient (coefficient of the security dummy). As its major limitation, the dummy (senior/sub-debt) would assume that the differential effect of the type of security on announcement returns is constant across all other covariates (see, Gujarati and Porter, 2009, p.289). In this case, a higher *CAR* for one security over another would imply that this is the case regardless of the bank and security-specific characteristics. This assumption is clearly untenable in our sample where the groups of senior debt and sub-debt announcements are distinct in all observable variables but the equity ratio. Also, using a single equation for both groups of security announcements assumes that the unobserved variation between these groups would be the same and this is a far-fetched supposition given the already notable variation in the observable covariates. Effectively, the security dummy would force the unobserved variation, captured by the single error term, to be the same across both groups resulting in misleading conclusions (Gujarati and Porter, 2009; Hoetker, 2007).

In light of the above caveats, a compassion between the groups would be informative and even more meaningful given the roughly similar size of the group of senior and sub-debt announcements. To proceed, we use the *CAR* for the event window [-1,0] for each group of

senior and sub-debt announcers as the dependent variable. For robustness purposes, similar analyses are conducted using the *CAR* of the alternative window [-1,1] as the dependent variable. We run these specifications, with standard errors corrected for heteroscedasticity, across similar scenarios or sub-samples as in the univariate analysis, thus by bank-size and capitalization levels.

4.5.3.1 Tail Risk and Abnormal Returns

Table 4-10 reports the results of the linear regression model that estimates the relationship between the abnormal stock returns and *Tail Risk*. The first 3 columns estimate the relationship with the CAR for the event window [-1,0] and the latter columns are with respect to the alternative window of [-1,1]. The estimates for sub-debt offers are reported in columns (1) and (4) while columns (2) and (5) report those for senior debt. We also show the difference of coefficients between senior and sub-debt in columns (3) and (6).

[Insert Table 4-10]

The main result in Table 4-10 is that *Tail Risk* significantly explains the stock returns of banks that announce senior debt but not for those announcing sub-debt. The difference in the impact of risk between the two offerings is significant (column 3) and the results hold across both event windows. These results, therefore, confirm the univariate results that risky banks attract a significantly positive reaction when announcing senior debt and this is not the case for sub-debt.

We find that other factors also condition shareholders' reactions to security announcements, and are, to some extent, in line with the univariate tests. For example, senior debt announcements are value-enhancing for banks that have a larger *Free-Cash Flow,* while sub-debt offers made during the *Dodd-Frank* era earn a positive reaction from shareholders. Although the influence of the *Crisis* on announcement returns of sub-debt is insignificant,

the variable has a significantly different impact between senior and sub-debt offers. A contrary result to the univariate tests is with regard to the influence of *Tobin's Q* on both offers. Banks with higher investment opportunities are in this case associated with a significantly higher shareholder value when offering sub-debt rather than senior debt. Otherwise, the overwhelming consistency with respect to the majority of the significant variables suggest that agency costs underlie the announcement of senior debt as shown in the univariate tests. We further illustrate the presence of these agency costs by examining the influence of the main independent variable, *Tail Risk*, on the announcement of securities across sub-samples of banks.

4.5.3.2 Tail Risk and Bank-Size

Based on earlier arguments that bail-out expectations incite risk-taking in large banks, we test for the influence of risk on the share value of large banks that announce senior or sub-debt. We present the results of this relationship in Table 4-11 where we allocate banks to size categories as in the prior univariate analysis and report the results for large banks, and the difference in the coefficients between the securities, in the first 3 columns while the results for small banks are in columns (4) to (6). We compare the impact of *Tail Risk* across bank-sizes for sub-debt and senior debt offers in columns (7) and (8), respectively.

[Insert Table 4-11]

We find that risky banks that announce senior debt earn significantly positive stock returns when they are large. The influence of *Tail Risk* on these offers is significantly different from sub-debt, which is insignificant. Interestingly, *Tail Risk* has no impact the share value of either security when banks are small. Most notable is the fact that risky banks that announce senior debt earn a significantly more positive stock return when they are large than when they are small (column 8). We further confirm these results using the alternative [-1,1]

CAR as the dependent variable in the additional Table A.4-8, where senior debt offers made by risky and large banks continue to earn greater wealth for shareholders.

So far, the results are consistent with the risk-shifting opportunities available for large banks in general (for example, Afonso et al., 2014; Hagendorff et al., 2018), but specifically they show that these motivations also vary with the type of security used. In particular, shareholders of risky and large banks appear to derive greater value in the risk-shifting opportunities presented by using senior debt, against a reasonable expectation that these banks would rather value the use of a regulatory element that would attenuate their risk concerns. We interpret this unexpected behavior as an indication that shareholders see the use of senior debt as an opportunity to enhance their wealth by expropriating junior debtors (Jensen and Smith Jr, 1985), and banks specifically avoid using capital instruments that will dilute the value of their deposit insurance (Marcus, 1984). We elaborate on these claims in the following analysis.

4.5.3.3 Tail Risk and Bank-Capitalization

Under this analysis, we assess the validity of earlier claims that banks remain under-capitalized and get riskier in an effort to maximize the value of the insurance cover that will be triggered by the imminent bankruptcy. In other ways, these actions also shift risk to sub-debt holders given their subordinated position upon bankruptcy. Essentially, we test if shareholders place little regulatory value on the announcement of sub-debt as a capital instrument, even for banks that need to improve their regulatory capital. By the same test, we aim to reveal the share valuation of weak banks (risky and less-capitalized) upon announcement of a security that offers no regulatory cushion - senior debt. Our tests should finally reveal if the opportunities for risk-shifting and wealth-expropriation that are common with the use of senior debt act against the financial stability objectives of including junior debt in regulatory capital, and the effectiveness of regulatory capital frameworks in general.

We present the results of the relationship between *Tail Risk* and abnormal stock returns of differently capitalized banks in Table 4-12. We make a similar categorization to the one used in the univariate analysis, where less-capitalized banks are those with a buffer below the median of the sample distribution in the quarter prior to the announcements, otherwise they are defined as being well-capitalized. Columns (1) to (3) report the estimates for the less-capitalized banks, and those for well-capitalized banks follow in columns (4) to (5), with the comparisons across bank capitalizations for sub-debt and senior debt being shown in columns (7) and (8), respectively.

[Insert Table 4-12]

The results in Table 4-12 show that risky banks that announce senior debt earn significantly positive wealth for shareholders when they are less-capitalized (column 2) and these valuation effects are significantly different when compared to sub-debt offers (column 3). The results are surprising given that the shareholders of banks that need to raise their capital levels would be expected to share views similar to regulators on the importance of sub-debt in this regard. However, the share valuation of well-capitalized banks does not depend on bank risk for either senior or sub-debt offers (columns 4 to 6). Across bank capitalization levels, we also do not see any significant association between *Tail Risk* and stock returns for sub-debt offers (column 7). For senior debt, however, we find risky banks add significantly positive value to shareholders only when they are less-capitalized (column 8). These results are robust to the use of the *CAR* for the alternative event window, as shown under additional Table A.4-9.

In summary, our assessment points to a clear tendency of banks to remain under-capitalized by preferring to announce non-regulatory capital elements. Specifically, sub-debt remains value-irrelevant to shareholders even for banks that would derive a greater regulatory benefit from its issuance. This evidence conclusively points to acts of delayed recapitalization

by banks in an attempt to exploit the opportunities to shift risk and expropriate other stakeholders. Most importantly, our findings support arguments that shareholders see the use senior debt as an opportunity to advance their interests of expropriating and shifting risk to the junior debt holders, in this case sub-debt. The validity of these arguments follows from the fact that senior debt securities do not count towards the regulatory capital of a bank, and as such do not contribute towards the safety and soundness of an institution. Rather, the use of senior debt is a leverage-increasing action that raises the risk premium of issuers with a consequent reduction on the value of existing bonds (Black and Cox, 1976; Black and Scholes, 1973) and these value-effects are most severe to the residual unprotected junior claimants, i.e. sub-debt, while positive to shareholders' wealth (Masulis, 1980; Smith and Warner, 1979; Tang and Singer, 1993).

Arguably, the financial decisions of banks in the US are bound by the minimum regulatory equity requirement, hence banks acting in the interests of shareholders may not freely restructure their liability components in a ways that explore the risk-shifting or wealth-expropriation opportunities associated with senior debt. Essentially, the 3% equity ratio (see, Federal Reserve System, 1992; 2007; 2013) is a binding constraint that potentially restrain the debt structure decisions of banks.

Nonetheless, this argument would contradict our summary statistics results (Table 4-2), which indicate that banks announcing senior or sub-debt have an average *Equity Ratio* greater than 7%, hence do not seem to be constrained in a way that would substantially limit their ability to exploit the opportunities to shift risk or expropriate the wealth of other stakeholders through senior debt. Furthermore, banks that announce senior debt are indistinguishable from those that announce sub-debt based on the *Equity Ratio*, which gives us some reasonable expectation that the discrepancies in the reaction of shareholders to either security could be traceable to the underlying incentives associated with senior or sub-

debt, rather than the dynamics of the equity ratio. In addition, the results of the multivariate analysis (Table 4-10) reveal that the *Equity Ratio* is irrelevant to the stock returns of banks that announce senior debt while inconclusive for sub-debt announcements. On this basis, the constraints placed by the regulatory equity ratio seem to be trivial to the findings that banks significantly price the opportunity to shift risk or expropriate wealth from other stakeholders through the use of senior debt.

It is equally conceivable that regulatory inefficiencies could be driven by conflicts specific to sub-debt rather than the moral hazard incentives underlying senior debt. For example, shareholders could view the disciplinary ability of sub-debt as a constraint to their risk-taking activities (see among others, Belkhir, 2013; Evanoff et al., 2011). Specifically, the displeasure to sub-debt announcement would be greater for less-risky banks that still have room to explore their risk-taking potential. Also, the issuance of sub-debt would reduce future debt capacity thereby limiting shareholder's ability to take advantage of value-enhancing opportunities presented by senior debt. In this case, the shareholder value perceptions with regard to sub-debt would be determined by the strength of these disincentives vis-a-vis the regulatory motives of the instrument.

Notwithstanding these arguments, our earlier results indicate that the reaction of shareholders to the announcement of sub-debt is independent of the riskiness of a bank (Tables 4-6 and 4-10), which suggests that shareholders do not regard the disincentives arising from the disciplinary effect of sub-debt in their value perceptions. Also, the relatively high *Equity Ratio* of banks announcing either security does not suggest that banks would be constrained to structure their debt in ways that would advance their future interests. Effectively, the disincentives for using sub-debt appear to be generally weak to dilute the regulatory incentives of the instrument, and as such, the wealth-expropriation and risk-shifting opportunities associated with senior debt seem to be the underlying drivers of

shareholders' perceptions towards sub-debt. We argue that these opportunities limit the regulatory role of sub-debt in bank capital and distort well-intended regulatory intentions that continue to recognize the instrument as an important candidate in the financial stability of banks. For this reason, the regulatory and shareholder expectations with respect to sub-debt will remain divergent as they are with other components of regulatory capital, namely equity, regulatory capital adjustments and Tier 2 capital in general.[37]

Overall, the dominancy of agency costs bred by the priority of debt within the broader bank capital structure seem to explain findings about the ineffectiveness of capital frameworks in directing bank behavior (Admati, 2016; Krishnan et al., 2010), especially when these frameworks include sub-debt (Barrell et al., 2011; Davies, 2015; Schoenmaker, 2015).

After successfully establishing the effects of security choices on shareholders' wealth and how these choices are moderated by risk-shifting and wealth-expropriation opportunities, we proceed to examine the impact of the security issuance decision on the long-term risk behavior of a banks.

4.6 The Long-Term Risk Behavior of Senior and Sub-Debt Issuers

The evidence that security choice decisions tend to alter the long-term risk profile of non-financial institutions (see, Healy and Palepu, 1990; Lewis et al., 2002) raises grave concerns about the use of financial instruments in banking. Given that regulatory efforts are mainly concerned with maintaining financial stability through capital-issuance (Federal Reserve System, 2013; 2017), the effect of the issuance decisions on the risk behavior of banks therefore becomes crucial more especially if there are shareholder-incentives within

[37] See among others, Cornett et al. (1998); Laderman (1994); Lubberink and Willett (2016); Wall and Peterson (1991) for adverse shareholder valuation effects of other regulatory capital elements.

the wider capital structure that potentially interfere with these financial stability goals. As such, the findings that shareholders value the announcement of non-regulatory securities that offer opportunities for risk-shifting viz., senior debt, informs us to further review how the issuance of senior or sub-debt profiles the risk behavior of banks in the long-run.

4.6.1 Univariate Analysis

The tests under this section, therefore, seek to highlight whether the use of senior debt in banking supports the risk-shifting incentives of shareholders. The presence of these motives will show if banks that use senior debt become riskier post-issuance. Specifically, this behavior would be most pronounced in banks that are already risky, based on their pre-issuance tail risk, but still go ahead with senior debt issuance in an attempt to off-load their risky positions to the unsecured subordinate debt holders and the safety nets.

4.6.1.1 Post-Issuance Risk of Senior and Sub-Debt Issuers

Table 4-13 reports results of the adjusted median risk of senior and sub-debt issuers over several post-issuance periods. The median tail risk in the post-issuance periods is adjusted by the 1-year pre-issuance median of the matching bank. The first 3 columns show the results of senior and sub-debt issuers based on quartile matching and the associated differences between the issuers. Columns (4) to (6) are quintile-matched issuers while the last 3 columns are with respect to decile-matching.

[Insert Table 4-13]

By any form of matching, and in all periods, senior debt issuers get significantly riskier than sub-debt issuers post-issuance. For sub-debt, the risk behavior of issuers does not change in the main matching sample. However, there are some elements of post-issuance risk reduction from the instrument under the quintile- and decile-matched samples. These

findings confer with the short-term analysis that the use of senior debt presents risk-shifting opportunities for banks/shareholders.

Perhaps using the median over the post-issuance period unduly disadvantages senior debt given their populated offers. On this possibility, we adjust the issuer's tail risk at the end of the quarter by the 1-year pre-issuance median of the matching bank. For example, we adjust the tail risk at the 8th quarter post-issuance by the 1-year pre-issuance median of the matching bank. The results of this adjustment are reported under Table A.4-10 as an additional table, where senior debt issuers still emerge riskier than sub-debt issuers in the following quarters after issuance. The results are also consistent across the methods of matching. Generally, the risk-shifting incentives associated with senior debt appear to overweigh the regulatory and presumptive disciplinary benefit of sub-debt.

Given our preceding evidence that senior debt harbors risk-shifting motives, we argue that these incentives will be valuable for banks that have a legacy of being risky and would, therefore, consider the use of senior debt as an opportunity to shed their risk. We evaluate this behavior by comparing the risk behavior of banks that are risky in the quarter prior to issuance as compared to the less risky, where less-risky banks have a tail risk below the median of the sample distribution, otherwise they are defined as being risky. Table 4-14 presents the results of this comparison.

[Insert Table 4-14]

Table 4-14 shows that risky banks that subsequently issue senior debt get significantly riskier post-issuance. The adjusted post-issuance median risk for these banks is significantly higher than for sub-debt at all post-issuance times. Notably, the post-issuance risk behavior of banks that issue senior debt amid their risky position is also significantly different from the less-risky issuers (column 8). However, the post-issuance risk behavior of banks that are

less-risky prior issuance is independent of the security issued and does not generally change (columns 4 to 6). The behavior of sub-debt issuers also does not depend on their pre-issuance risk position. This evidence so far suggests that senior debt acts as a conduit through which banks can shift risk. We put this evidence through further tests that control for the influence of other factors on the post-issuance risk profile of banks in the succeeding analysis.

4.6.2 Multivariate Analysis

Our analysis at this point attempts to isolate the impact of security choice on the post-issuance risk behavior of banks by controlling for the median adjusted risk a year prior to issuance and other possible explanations of bank risk. The analysis runs a linear regression with the adjusted post-issuance risk as the dependent variable. Any unexplained post-issuance risk would be captured by the intercept and attributable to a particular security issuance decision.

4.6.2.1 Post-Issuance Risk of Senior and Sub-Debt Issuers

Table 4-15 reports the regression results on the adjusted median tail risk of senior and sub-debt issuers across various post-issuance periods.

[Insert Table 4-15]

According to Table 4-15, a number of control variables appear to influence the post-issuance risk profile of senior and sub-debt issuers. However, these effects are either inconsistent, weak or non-persistent thereby offering inconclusive explanations on the risk behavior of banks following security issuance. On the other hand, there is some consistency in the sign and significance of the *Intercept* of the regression model. The *Intercept* is only significantly positive for senior debt issuers across the majority of post-issuance periods and it is significantly different from that of sub-debt issuers in most cases. This pattern generally support the long-term univariate results, in that, the issuance of senior debt increases a bank's

post-issuance risk while using sub-debt has no impact on the risk behavior of banks. The irrelevance of sub-debt on the post-issuance risk behavior of banks could be an indication that the instrument lacks a preventative influence as suggested by Krishnan et al. (2005), but it may also be the case that the strength of the risk-shifting opportunities that come along with using senior debt eclipses this effect, as it had with the regulatory effect of sub-debt.

Our final analysis examines the post-issuance risk behavior of banks that have a legacy of being risky in a multivariate setting. The categorization of risky and less-risky banks is as in the univariate analysis. We show the results of the regression on the adjusted median post-issuance tail risk of risky banks that issue senior or sub-debt in Table 4-16.

[Insert Table 4-16]

The results in Table 4-16 indicate that risky banks that proceed to issue senior debt observe a significantly positive median tail risk (as shown by the *Intercept*) in the post-issuance period as compared to those that issue sub-debt. The post-issuance risk of sub-debt issuers remains insignificant, except over the 2-year period (column 16). In a series of further tests that we present as additional tables, Table A.4-11, we find that the post-issuance risk of less-risky senior debt issuers is not consistently significant, and their risk behavior is generally not different from sub-debt issuers as is the case with their risky counterparts.

A slight caveat, however, is that the issuance of sub-debt appears to increase the risk of less-risky banks over the 2-year period after issuance (Table A.4-11, column 16). This latter result contradicts theories on the disciplinary effect of sub-debt. Perhaps it indicates that sub-debt holders relax their disciplining restraint on banks with less risk and these banks ultimately get riskier as their risk-taking goes unchecked. When we follow up this claim with intra-security analysis, we notice some significant risk-reductions across most post-issuance periods (including over the 2-year period) on risky banks that issue sub-debt as compared to

less-risky ones (Table A.4-12). To some degree, this latter finding suggests that sub-debt exhibits some degree of preventative influence, especially when the market already understands the risk position of the issuer. In this regard, the disciplinary actions of sub-debt are important to risky banks.

With respect to senior debt, risky banks that issue the instrument tend to be significantly riskier in the post-issuance period, particularly the longer term periods, as compared to less-risky ones (Table A.4-13). We interpret this as a deliberate effort by banks to use senior debt when they are already vulnerable in an attempt to shift their risk positions to other stakeholders.

In sum this analysis demonstrates that the use of senior debt presents risk-shifting opportunities that potentially undermine both the regulatory role and the disciplinary effect of sub-debt.

4.7 Conclusions

Regulators continue to place confidence in sub-debt as an important aspect of financial stability, as envisioned in the regulatory capital frameworks. These regulatory actions have, however, attracted a lot of resistance from the market with views that sub-debt is deficient as a form of regulatory capital, hence the capital frameworks that continue to recognize it are flawed and ineffective in controlling bank behavior and risk.

In this study, we show that the purported regulatory inefficacy of sub-debt as a regulatory element is brought about by incentives within the priority structure of bank capital that drive bank shareholders to place greater value on the risk-shifting and wealth-expropriation opportunities related to the use of senior debt. We carry out numerous tests to show that the announcement of senior debt is more valuable to shareholders even on occasions where the regulatory benefit of sub-debt would be superior. In particular, our event-study analyses

reveals that shareholders of less-capitalized or risky banks derive more wealth from senior debt that does little to attenuate the capital or risk concerns of a bank instead of a regulatory capital element. We also notice that senior debt offers create significant share value for banks that are risky and large. Based on these risk-shifting motives, our analysis of the post-issuance risk indicates that senior debt issuers become riskier than sub-debt issuers in the post-issuance period, especially when they went ahead with the issuance in spite of their risky pre-issuance status.

Overall, our findings are in line with arguments that shareholders consider the use of senior debt as an opportunity to advance their interests of expropriating and shifting risk to junior debt holders. Effectively, these incentives limit the regulatory role of sub-debt in bank capital and distort well-intended regulatory efforts that continue to recognize the instrument as a capital element. In this regard, the perceived regulatory deficiencies of sub-debt, and the frameworks that recognize it, owes little to its form and design but are traceable to the agency costs arising from the priority structure of elements in the wider capital structure of a bank. Our analysis, therefore, add to the broader debates on the efficiency (or otherwise) of regulatory capital frameworks and underscores the need to account for the general conflicts on interests in the wider capital structure, which dilute the efficacy of these frameworks.

Tables and Figures - Chapter 4

Table 4-1: Distribution of Senior and Sub-Debt Offers from 1983 to 2015

This table summarizes our sample of banks that have announced senior and sub-debt on an annual basis, the relative frequencies and the average proceeds from both securities.

Year	All Banks	Sub-Debt Offers					Senior Debt Offers				
		Issuers	Issuers to Banks	No. Offers	Offers to Banks	Average Amount ($mil)	Issuers	Issuers to Banks	No. Offers	Offers to Banks	Average Amount ($mil)
1983	3	3	1.0	3	1.0	140.0	0	0.0	0	0.0	0.0
1984	7	7	1.0	8	1.1	183.4	0	0.0	0	0.0	0.0
1985	6	6	1.0	6	1.0	150.1	0	0.0	0	0.0	0.0
1986	3	3	1.0	3	1.0	33.3	0	0.0	0	0.0	0.0
1987	12	10	0.8	16	1.3	313.6	2	0.2	2	0.2	62.5
1988	5	5	1.0	7	1.4	243.6	0	0.0	0	0.0	0.0
1989	13	11	0.8	16	1.2	171.9	3	0.2	6	0.5	129.2
1990	10	6	0.6	16	1.6	113.6	4	0.4	6	0.6	119.2
1991	13	11	0.8	20	1.5	146.3	2	0.2	2	0.2	275.0
1992	14	13	0.9	24	1.7	173.7	1	0.1	1	0.1	150.0
1993	19	15	0.8	31	1.6	171.8	4	0.2	5	0.3	105.0
1994	11	8	0.7	10	0.9	146.3	3	0.3	11	1.0	62.2
1995	12	8	0.7	11	0.9	135.2	4	0.3	28	2.3	74.3
1996	12	8	0.7	9	0.8	257.8	4	0.3	30	2.5	64.9
1997	10	6	0.6	10	1.0	192.3	4	0.4	10	1.0	73.0
1998	13	9	0.7	9	0.7	299.2	4	0.3	5	0.4	170.0
1999	8	4	0.5	4	0.5	256.3	4	0.5	37	4.6	290.8
2000	10	3	0.3	3	0.3	283.3	8	0.8	40	4.0	181.5
2001	8	5	0.6	6	0.8	1091.7	5	0.6	40	5.0	163.4
2002	5	5	1.0	5	1.0	641.3	0	0.0	0	0.0	0.0
2003	13	10	0.8	13	1.0	312.1	3	0.2	10	0.8	265.0
2004	6	3	0.5	4	0.7	193.8	3	0.5	22	3.7	950.4
2005	8	6	0.8	9	1.1	1062.6	4	0.5	18	2.3	785.4
2006	7	4	0.6	11	1.6	772.9	3	0.4	28	4.0	971.3
2007	9	9	1.0	9	1.0	242.8	1	0.1	8	0.9	1263.8
2008	3	2	0.7	2	0.7	105.0	1	0.3	2	0.7	12.6
2009	4	2	0.5	2	0.5	16.1	2	0.5	17	4.3	345.9
2010	4	1	0.3	1	0.3	37.5	3	0.8	16	4.0	809.7
2011	3	0	0.0	0	0.0	0.0	3	1.0	11	3.7	628.0
2012	5	1	0.2	1	0.2	75.0	4	0.8	8	1.6	1262.5
2013	7	7	1.0	9	1.3	914.0	0	0.0	0	0.0	0.0
2014	17	17	1.0	19	1.1	561.7	0	0.0	0	0.0	0.0
2015	12	12	1.0	13	1.1	251.0	0	0.0	0	0.0	0.0
Total	**292**	**220**	**0.8**	**310**	**1.1**	**-**	**79**	**0.3**	**363**	**1.2**	**-**
Average Amount Raised ($mil)						**308.8**					**398.2**
Total Amount Raised ($mil)						**95 713.9**					**144 561.2**

Table 4-2: Analysis of Banks that Announced Senior or Sub-Debt

This table summarizes the descriptive statistics for senior and sub-debt offers and the associated mean difference. Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Bank-Size is the logarithm of total assets; Amount is the Dollar amount raised; Debt Quality is a dummy variable equal to 1 for debt issues with a S&P rating of BBB- or better, or 0 otherwise; Maturity is the logarithm of years to maturity; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Free-Cash Flow is the ratio of operating cash to total assets; Tax is the ratio of taxes to pre-tax earnings; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall, the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns; Crisis is a dummy variable equal to 1 for periods falling within banking crisis periods as identified by Liu and Ngo (2014), or 0 otherwise; Dodd-Frank is a dummy variable equal to 1 for the periods after the implementation of the Dodd-Frank Act in July 2010 (inclusive), or 0 otherwise. Bank-Size and Maturity are in logarithmic terms while Amount is in millions of Dollars, otherwise all other continuous covariates are in ratios/fractions (not percent). The notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Variables	**Sub-Debt**				**Senior Debt**				**Mean Difference**
	N	Mean	Median	Std. Dev.	N	Mean	Median	Std. Dev.	Sub-Debt vs Senior Debt
Tail Risk	310	0.031	0.027	0.016	363	0.041	0.033	0.031	-0.011***
Buffer	310	0.036	0.036	0.023	363	0.044	0.038	0.018	-0.008***
Bank-Size	310	10.25	10.38	1.478	363	11.25	11.73	0.930	-0.999***
Amount	310	308.8	150.0	509.7	363	398.2	100.0	623.1	-89.49**
Debt Quality	310	0.742	1.000	0.438	363	0.934	1.000	0.249	-0.192***
Maturity	310	3.047	2.319	1.581	363	1.306	1.115	0.855	1.740***
Tobin's Q	310	1.373	1.213	0.633	363	2.050	1.982	0.876	-0.678***
Equity Ratio	310	0.073	0.074	0.017	363	0.072	0.071	0.018	0.001
Free-Cash Flow	308	0.003	0.003	0.003	363	0.004	0.005	0.005	-0.001***
Tax	310	0.300	0.307	0.075	363	0.329	0.329	0.056	-0.028***
Recession	310	0.071	0.000	0.257	363	0.124	0.000	0.330	-0.053**
MES	310	0.013	0.012	0.013	363	0.026	0.017	0.021	-0.012***
Crisis	310	0.352	0.000	0.478	363	0.099	0.000	0.299	0.252***
Dodd-Frank	310	0.135	0.000	0.343	363	0.072	0.000	0.258	0.064***

Table 4-3: Abnormal Stock Returns for Senior and Sub-Debt Offers

This table presents the cumulative announcement returns (CAR), in percent, for senior and sub-debt offers for the event windows [-1,0] and [-1,1] over the sample period 1983 to 2015. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

		(1)	(2)	(3)	(4)	(5)	(6)
Announcement Window		Market Model			3-Factor Model		
		Sub-Debt	Senior Debt	Diff (1 vs 2)	Sub-Debt	Senior Debt	Diff (4 vs 5)
CAR [-1, 0]	Mean	-0.16	0.50***	-0.65***	-0.09	0.35***	-0.44***
	Median	-0.15	0.65***	-0.80***	-0.10	0.38***	-0.48***
CAR [-1, 1]	Mean	-0.28*	0.44**	-0.72***	-0.14	0.31**	-0.45**
	Median	-0.15	0.42***	-0.57***	-0.11	0.16	-0.27*
Observations		310	363		310	363	

Table 4-4: Abnormal Stock Returns by Bank Capitalization (Less-Capitalized vs Well-Capitalized)

This table presents the cumulative announcement returns (CAR), in percent, for senior and sub-debt offers of Less- and Well-Capitalized banks over for the event windows [-1,0] and [-1,1]. The sample period runs from 1983 to 2015. Banks are Less-Capitalized if their buffer falls below the median of the sample distribution, otherwise they are classified as being Well-Capitalized, where buffer is the actual regulatory capital adequacy ratio less the minimum required. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Less-Capitalized Banks Sub-Debt	(2) Less-Capitalized Banks Senior Debt	(3) Diff (1 vs 2)	(4) Well-Capitalized Banks Sub-Debt	(5) Well-Capitalized Banks Senior Debt	(6) Diff (4 vs 5)	(7) Diff (1 vs 4)	(8) Diff (2 vs 5)
CAR [-1, 0]	Mean	-0.15	0.91***	-1.06***	-0.16	0.24	-0.40	0.01	0.68**
	Median	-0.25	1.26***	-1.51***	-0.06	0.31*	-0.37	-0.19	0.95***
CAR [-1, 1]	Mean	-0.31	0.41	-0.72*	-0.22	0.46**	-0.68**	-0.09	-0.05
	Median	-0.26	0.53**	-0.89***	-0.12	0.33**	-0.35*	-0.14	0.20
Observations		192	140		118	223			

Table 4-5: Abnormal Stock Returns by Bank Capitalization (Capital-Constrained Vs Unconstrained)

This table presents the cumulative announcement returns (CAR), in percent, for senior and sub-debt offers of Capital-Constrained and Unconstrained banks over the event windows [-1,0] and [-1,1]. The sample period runs from 1983 to 2015. Banks are Capital-Constrained if their buffer falls below the 25th percentile of the sample distribution and they are classified as being Unconstrained if their buffer is at or above the 75th percentile of the sample distribution, where buffer is the actual capital adequacy ratio less the minimum required. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Announcement Window		Capital-Constrained Banks		Diff	Unconstrained Banks		Diff	Diff	Diff
		Sub-Debt	Senior Debt	(1 vs 2)	Sub-Debt	Senior Debt	(4 vs 5)	(1 vs 4)	(2 vs 5)
CAR [-1, 0]	Mean	-0.15	1.84***	-1.99***	-0.21	-0.55***	0.33	0.06	2.38***
	Median	-0.25	1.26*	-1.51***	-0.11	-0.18	0.07	-0.14	1.44***
CAR [-1, 1]	Mean	-0.42	1.30***	-1.72**	-0.37	-0.23	-0.14	-0.05	1.53***
	Median	-0.34	1.42**	-1.76***	-0.15	-0.16	0.01	-0.19	1.58***
Observations		133	33		68	101			

Table 4-6: Abnormal Stock Returns by Bank Risk

This table presents the cumulative announcement returns (CAR), in percent, for senior and sub-debt offers of Less-Risky and Risky banks over the event windows [-1,0] and [-1,1]. The sample period runs from 1983 to 2015. Banks are Less-Risky if their Tail Risk falls below the median of the sample distribution, otherwise they are classified as being Risky, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Risky Banks Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) Less-Risky Banks Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) Diff (1vs4)	(8) Diff (2vs5)
CAR [-1, 0]	Mean	-0.18	0.98***	-1.16***	-0.14	-0.20	0.06	-0.04	1.18***
	Median	-0.17	1.22***	-1.39***	-0.15	0.15	-0.30	-0.02	1.07***
CAR [-1, 1]	Mean	-0.45	1.32***	-1.77***	-0.16	-0.83***	0.67**	-0.29	2.14***
	Median	-0.26	0.63***	-0.89***	-0.08	0.09	-0.17	-0.18	0.54***
Observations		125	215		185	148			

Table 4-7: Abnormal Stock Returns by Bank Size

This table presents the cumulative announcement returns (CAR), in percent, for senior and sub-debt offers of Small and Large banks over the event windows [-1,0] and [-1,1]. The sample period runs from 1983 to 2015. Banks are Small if the logarithm of their assets falls below the median of the sample distribution otherwise they are classified as being Large. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Large Banks Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) Small Banks Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) Diff (1vs4)	(8) Diff (2vs5)
CAR [-1, 0]	Mean	-0.28	0.78***	-1.06***	-0.09	-0.01	-0.08	-0.18	0.79***
	Median	-0.10	1.04***	-1.14***	-0.17	0.20	-0.37	0.06	0.84***
CAR [-1, 1]	Mean	-0.52**	0.46*	-0.98**	-0.15	0.41*	-0.56*	-0.37	0.05
	Median	-0.08	0.51***	-0.59***	-0.26	0.30**	-0.56*	0.16	0.21
Observations		107	232		203	131			

Table 4-8: Abnormal Stock Returns of Large Banks by Risk Levels

This table presents the cumulative announcement returns (CAR), in percent, for senior and sub-debt offers of Large banks across risk levels. The CARs are estimated calculated over the event windows [-1,0] and [-1,1] for the sample period 1983 to 2015. Banks are Large if the logarithm of their assets is at or above the median of the sample distribution. Less-Risky banks are those with Tail Risk below the median of the sample distribution, otherwise they are classified as being Risky, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Risky Banks Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) Less-Risky Banks Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) Diff (1vs4)	(8) Diff (2vs5)
CAR [-1, 0]	Mean	-0.28	1.59***	-1.87***	-0.28	-0.67*	0.39	0.00	2.26***
	Median	-0.10	1.67***	-1.77***	-0.15	-0.75*	0.60	0.05	2.42***
CAR [-1, 1]	Mean	-0.56	1.99***	-2.54***	-0.50*	-2.28***	1.78***	-0.06	4.27***
	Median	0.05	1.29***	-1.24***	-0.17	-1.22**	1.05***	0.22	2.53***
Observations		37	149		70	83			

Table 4-9: Abnormal Stock Returns of Less-Capitalized Banks by Risk Levels

This table presents the cumulative announcement returns (CAR), in percent, for senior and sub-debt offers of Less-Capitalized banks across risk levels. The CARs are calculated over the event windows [-1,0] and [-1,1] for the sample period 1983 to 2015. Banks are Less-Capitalized if their buffer falls below the median of the sample distribution, where buffer is the actual regulatory capital adequacy ratio less the minimum required. Less-Risky banks are those with Tail Risk below the median of the sample distribution otherwise they are classified as being Risky, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Risky Banks Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) Less-Risky Banks Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) Diff (1vs4)	(8) Diff (2vs5)
CAR [-1, 0]	Mean	-0.25	1.91***	-2.16***	-0.07	-0.50	0.43	-0.18	2.41***
	Median	-0.19	1.96***	-2.15***	-0.40*	-0.50	0.10	0.21	2.46***
CAR [-1, 1]	Mean	-0.48	2.37***	-2.85***	-0.17	-2.36***	2.19***	-0.31	4.73***
	Median	-0.21	1.71***	-1.92**	-0.30	-0.61	0.31***	0.09	2.32***
Observations		88	82		104	58			

Table 4-10: Relationship between Abnormal Stock Returns and Tail Risk

This table reports the relationship between abnormal stock returns and Tail Risk for senior and sub-debt announcements over the sample period 1983 to 2015. The results are estimated using a linear regression model with the cumulative abnormal returns over the event windows [-1,0] and [-1,1] as the dependent variable. Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Bank-Size is the logarithm of total assets while Issue-Size is the logarithm of the amount raised; Debt Quality is a dummy variable equal to 1 for debt issues with a S&P rating of BBB- or better, or 0 otherwise; Maturity is the logarithm of years to maturity; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Free-Cash Flow is the ratio of operating cash to total assets; Tax is the ratio of taxes to pre-tax earnings; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall, the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns; Crisis is a dummy variable equal to 1 for periods falling within banking crisis periods as identified by Liu and Ngo (2014), or 0 otherwise; Dodd-Frank is a dummy variable equal to 1 for the periods after the implementation of the Dodd-Frank Act in July 2010 (inclusive), or 0 otherwise. Bank-Size, Issue-Size and Maturity are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1)	(2)	(3)	(4)	(5)	(6)
	Cumulative Abnormal Return [-1,0]			Cumulative Abnormal Return [-1,1]		
	Sub-Debt	Senior Debt	Diff(1 vs 2)	Sub-Debt	Senior Debt	Diff(4 vs 5)
Tail Risk	-0.072	0.438**	-0.510**	-0.359	0.996***	-1.355***
	(0.171)	(0.186)		(0.224)	(0.251)	
Buffer	-0.080	-0.318***	0.238*	-0.023	-0.096	0.073
	(0.094)	(0.089)		(0.106)	(0.137)	
Bank-Size	-0.001	0.002	-0.004	-0.003*	0.000	-0.003
	(0.002)	(0.002)		(0.002)	(0.003)	
Issue-Size	-0.001	0.001	-0.002	0.000	0.002	-0.002
	(0.002)	(0.001)		(0.002)	(0.002)	
Debt Quality	0.004	0.016	-0.012	0.004	0.034*	-0.029
	(0.005)	(0.013)		(0.005)	(0.018)	
Maturity	-0.001	-0.001	0.001	-0.001	-0.002	0.001
	(0.001)	(0.002)		(0.001)	(0.002)	
Tobin's Q	0.008***	-0.010***	0.019***	0.011***	-0.019***	0.029***
	(0.003)	(0.003)		(0.003)	(0.004)	
Equity Ratio	-0.124	0.025	-0.149	-0.257**	0.102	-0.359*
	(0.097)	(0.118)		(0.116)	(0.153)	
Free-Cash Flow	-0.219	2.736***	-2.955***	-0.579	2.262**	-2.841**
	(0.626)	(0.674)		(0.889)	(0.921)	
Tax	0.030	-0.066	0.096**	0.051*	-0.048	0.099
	(0.022)	(0.042)		(0.030)	(0.056)	
Recession	0.001	0.008	-0.007	0.004	0.011	-0.006
	(0.008)	(0.005)		(0.011)	(0.008)	
MES	0.250	-0.106	0.356	0.096	-0.868***	0.964***
	(0.168)	(0.154)		(0.213)	(0.237)	
Crisis	0.002	-0.019**	0.021**	0.011**	-0.031***	0.042***
	(0.004)	(0.008)		(0.005)	(0.011)	
Dodd-Frank	0.010**	-0.010	0.021**	0.010*	-0.031***	0.041***
	(0.005)	(0.009)		(0.005)	(0.011)	
Constant	0.004	-0.010		0.018	-0.012	
	(0.018)	(0.023)		(0.019)	(0.035)	
Observations	308	363		308	363	
R-squared	0.081	0.164		0.099	0.193	

Table 4-11: Relationship between Abnormal Stock Returns and Tail Risk - Based on Bank Size

This table reports the relationship between abnormal stock returns and Tail Risk for senior and sub-debt announcements of Large and Small banks over the sample period 1983 to 2015. The results are estimated using a linear regression model with the cumulative abnormal returns over the event window [-1,0] as the dependent variable. Banks are Small if the logarithm of their assets fall below the median of the sample distribution otherwise they are defined as being Large. Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Bank-Size is the logarithm of total assets while Issue-Size is the logarithm of the amount raised; Debt Quality is a dummy variable equal to 1 for debt issues with a S&P rating of BBB- or better, or 0 otherwise; Maturity is the logarithm of years to maturity; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Free-Cash Flow is the ratio of operating cash to total assets; Tax is the ratio of taxes to pre-tax earnings; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall, the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns; Crisis is a dummy variable equal to 1 for periods falling within banking crisis periods as identified by Liu and Ngo (2014), or 0 otherwise; Dodd-Frank is a dummy variable equal to 1 for the periods after the implementation of the Dodd-Frank Act in July 2010 (inclusive), or 0 otherwise. Bank-Size, Issue-Size and Maturity are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1) Large Banks Sub-Debt	(2) Senior Debt	(3) Diff(1vs2)	(4) Small Banks Sub-Debt	(5) Senior Debt	(6) Diff(4vs5)	(7) Large Vs Small Banks Diff(1vs4)	(8) Diff(2vs5)
Tail Risk	0.054	1.634***	-1.581***	-0.129	0.047	-0.176	0.183	1.587***
	(0.222)	(0.210)		(0.207)	(0.224)			
Buffer	-0.099	-0.265*	-1.580	-0.073	-0.322***	0.249*	-0.026	0.057
	(0.176)	(0.151)		(0.108)	(0.109)			
Bank-Size	0.016*	0.033***	0.166	-0.001	0.005**	-0.006*	0.017*	0.028***
	(0.009)	(0.010)		(0.003)	(0.002)			
Issue-Size	-0.001	0.004***	-0.017**	-0.001	0.004*	-0.005	0.000	0.000
	(0.002)	(0.001)		(0.003)	(0.002)			
Debt Quality	0.028***	0.023***	-0.005	0.001	-0.014*	0.015*	0.027***	0.037***
	(0.007)	(0.006)		(0.006)	(0.007)			
Maturity	0.003*	-0.001	0.005	-0.001	0.002	-0.003	0.004**	-0.003
	(0.001)	(0.002)		(0.001)	(0.002)			
Tobin's Q	0.014***	-0.010**	0.004***	0.008**	0.003	0.005	0.006	-0.013**
	(0.005)	(0.005)		(0.003)	(0.005)			
Equity Ratio	0.077	0.026	0.024	-0.129	-0.048	-0.081	0.206	0.074
	(0.134)	(0.140)		(0.139)	(0.149)			
Free-Cash Flow	0.242	1.612***	0.051	-1.785*	0.560	-2.345*	2.027*	1.052
	(0.746)	(0.514)		(0.975)	(0.984)			
Tax	-0.083**	-0.271***	-1.370***	0.063**	-0.003	0.066	-0.146***	-0.268***
	(0.036)	(0.057)		(0.027)	(0.045)			
Recession	0.019***	0.019**	0.188	-0.004	0.002	-0.006	0.023**	0.017
	(0.006)	(0.008)		(0.010)	(0.011)			
MES	0.067	-0.942***	0.000***	0.329	-0.232	0.561**	-0.262	-0.710**
	(0.253)	(0.264)		(0.217)	(0.185)			
Crisis	-0.003	-0.036**	1.009*	0.001	-0.011*	0.012	-0.004	-0.025
	(0.007)	(0.017)		(0.005)	(0.006)			
Dodd-Frank	0.008	-0.072***	0.033***	0.005	0.020	-0.015	0.003	-0.092***
	(0.008)	(0.014)		(0.006)	(0.015)			
Constant	-0.215*	-0.346***	0.080	0.001	-0.044			
	(0.108)	(0.112)		(0.024)	(0.032)			
Observations	107	232		201	131			
R-squared	0.388	0.540		0.100	0.358			

Table 4-12: Relationship between Abnormal Stock Returns and Tail Risk - Based on Bank Capitalization

This table reports the relationship between abnormal stock returns and Tail Risk for senior and sub-debt announcements of Less- and Well-Capitalized banks over the sample period 1983 to 2015. The results are estimated using a linear regression model with the cumulative abnormal returns over the event window [-1,0] as the dependent variable. Banks are Less-Capitalized if their buffer falls below the median of the sample distribution otherwise they are defined as being Well-Capitalized. Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Bank-Size is the logarithm of total assets while Issue-Size is the logarithm of the amount raised; Debt Quality is a dummy variable equal to 1 for debt issues with a S&P rating of BBB- or better, or 0 otherwise; Maturity is the logarithm of years to maturity; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Free-Cash Flow is the ratio of operating cash to total assets; Tax is the ratio of taxes to pre-tax earnings; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall, the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns; Crisis is a dummy variable equal to 1 for periods falling within banking crisis periods as identified by Liu and Ngo (2014), or 0 otherwise; Dodd-Frank is a dummy variable equal to 1 for the periods after the implementation of the Dodd-Frank Act in July 2010 (inclusive), or 0 otherwise. Bank-Size, Issue-Size and Maturity are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Less-Capitalized Banks			Well-Capitalized Banks			Less- Vs Well-Capitalized	
	Sub-Debt	Senior Debt	Diff(1vs2)	Sub-Debt	Senior Debt	Diff(4vs5)	Diff(1vs4)	Diff(2vs5)
Tail Risk	-0.130	1.642***	-1.772***	-0.113	0.427	-0.540	-0.017	1.215***
	(0.202)	(0.274)		(0.259)	(0.325)			
Buffer	-0.146	-0.331	0.185	0.066	-0.374	0.440*	-0.212	0.043
	(0.170)	(0.652)		(0.101)	(0.233)			
Bank-Size	0.001	0.022***	-0.021***	-0.005**	0.012***	-0.017***	0.006**	0.010
	(0.002)	(0.007)		(0.002)	(0.003)			
Issue-Size	-0.003	0.009***	-0.012***	0.002	-0.005**	0.007**	-0.005	0.014***
	(0.003)	(0.002)		(0.003)	(0.002)			
Debt Quality	0.001	0.001	0.000	0.011	0.015	-0.004	-0.010	-0.014
	(0.006)	(0.015)		(0.007)	(0.021)			
Maturity	-0.000	-0.004*	0.004	-0.003	0.004	-0.007*	0.003	-0.008**
	(0.001)	(0.002)		(0.003)	(0.002)			
Tobin's Q	0.008*	-0.005	0.013**	0.009**	-0.021***	0.030***	-0.001	0.016*
	(0.004)	(0.004)		(0.004)	(0.008)			
Equity Ratio	-0.020	0.064	-0.084	-0.276*	0.093	-0.369*	0.256	-0.029
	(0.134)	(0.288)		(0.145)	(0.155)			
Free-Cash Flow	0.334	-5.779***	6.113***	-1.656	4.476***	-6.132***	1.990	-10.255***
	(0.701)	(1.286)		(1.940)	(1.388)			
Tax	0.039	-0.290***	0.329***	0.029	0.010	0.019	0.010	-0.300***
	(0.027)	(0.060)		(0.038)	(0.044)			
Recession	0.002	-0.043***	0.045***	0.002	0.003	-0.001	0.000	-0.046***
	(0.009)	(0.016)		(0.005)	(0.008)			
MES	0.153	-0.418	0.571	0.407*	-0.440	0.847**	-0.254	0.022
	(0.235)	(0.362)		(0.241)	(0.312)			
Crisis	-0.002	-0.012	0.010	0.011	0.006	0.005	-0.013	-0.018
	(0.005)	(0.020)		(0.013)	(0.018)			
Dodd-Frank	-0.002	0.000	-0.002	0.014***	-0.010	0.024**	-0.016*	0.010
	(0.008)	(0.000)		(0.005)	(0.009)			
Constant	-0.009	-0.186**		0.037	-0.094**			
	(0.022)	(0.077)		(0.034)	(0.046)			
Observations	190	140		118	223			
R-squared	0.089	0.649		0.186	0.305			

Table 4-13: Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers

This table presents the adjusted median Tail Risk, in percent, of senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers. Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Post Issuance Period		(1) Quartile Matching Sub-Debt	(2) Quartile Matching Senior Debt	(3) Diff(1vs2)	(4) Quintile Matching Sub-Debt	(5) Quintile Matching Senior Debt	(6) Diff(4vs5)	(7) Decile Matching Sub-Debt	(8) Decile Matching Senior Debt	(9) Diff(7vs8)
1st Quarter	Mean	-0.26	0.63***	-0.89***	-0.20	0.61***	-0.81***	-0.04	0.62***	-0.66**
	Median	-0.25	0.25**	-0.50***	-0.28	0.27**	-0.55***	-0.15	0.24	-0.39**
	N	102	177		83	166		51	105	
2nd Quarter	Mean	0.00	0.54***	-0.54**	-0.11	0.51***	-0.62***	-0.04	0.50***	-0.54**
	Median	-0.08	0.15	-0.23**	-0.26	0.16	-0.42**	-0.07	0.22	-0.29**
	N	102	180		83	168		51	107	
3rd Quarter	Mean	-0.10	0.53***	-0.63***	-0.36**	0.50***	-0.86***	-0.29*	0.47***	-0.76***
	Median	-0.14	0.13	-0.27***	-0.30*	0.09	-0.39***	-0.25	0.13	-0.38***
	N	102	181		83	169		51	107	
1st Year	Mean	-0.10	0.59***	-0.69***	-0.37**	0.54***	-0.91***	-0.30*	0.57***	-0.87***
	Median	-0.10	0.12	-0.22***	-0.28*	0.08	-0.36***	-0.25	0.14	-0.39***
	N	102	181		83	169		51	107	
2nd Year	Mean	0.01	1.02***	-1.01**	-0.09	0.87***	-0.96**	0.09	0.73***	-0.64
	Median	-0.25	0.22	-0.47***	-0.22	0.12	-0.34**	-0.28	0.35**	-0.63*
	N	97	153		79	145		47	89	
Over 2 Years	Mean	-0.14	0.45***	-0.59**	-0.21*	0.39***	-0.60***	-0.23*	0.24**	-0.47***
	Median	-0.11	0.15*	-0.26***	-0.19	0.21***	-0.40***	-0.30**	0.21**	-0.51***
	N	102	181		82	166		50	104	

Table 4-14: Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers by Bank Risk

This table presents the adjusted median Tail Risk, in percent, of Risky and Less-Risky senior and sub-debt issuers for the 8-quarters (2 years) post-issuance. The sample period runs from 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers. Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are Less-Risky if their Tail Risk falls below the median of the sample distribution otherwise they are defined as being Risky. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Post Issuance Period		(1) Risky Banks Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) Less-Risky Banks Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) Diff (1vs4)	(8) Diff (2vs5)
1st Quarter	Mean	-0.55	1.07***	-1.62***	0.00	0.15	-0.15	-0.55	0.92***
	Median	-0.53	0.54***	-1.07***	0.00	-0.09	0.09	-0.53**	0.63***
	N	47	92		55	85			
2nd Quarter	Mean	-0.12	0.93***	-1.05**	0.10	0.13	-0.03	-0.22	0.80***
	Median	-0.19	0.66***	-0.85***	-0.07	-0.02	-0.05	-0.12	0.68***
	N	47	93		55	87			
3rd Quarter	Mean	-0.25	0.91***	-1.16**	0.03	0.12	-0.09	-0.28	0.79***
	Median	-0.23	0.50**	-0.73***	-0.07	-0.09	0.02	-0.16	0.59***
	N	47	93		55	88			
1st Year	Mean	-0.29	0.94***	-1.23***	0.07	0.21*	-0.14	-0.36	0.73**
	Median	-0.12	0.64***	-0.76***	-0.08	-0.04	-0.04	-0.04	0.68**
	N	47	93		55	88			
2nd Year	Mean	-0.60	1.00**	-1.60*	0.55**	1.04***	-0.49	-1.15**	-0.04
	Median	-0.59**	-0.03	-0.56***	0.49*	0.46**	0.03	-1.08***	-0.49
	N	45	74		52	79			
Over 2 Years	Mean	-0.14	0.84***	-0.98*	-0.14	0.03	-0.17	0.00	0.81***
	Median	0.15	0.41***	-0.26*	-0.27**	0.01	-0.28**	0.42	0.40***
	N	47	93		55	88			

Table 4-15: Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers

This table presents the estimated linear regression results on the adjusted median Tail Risk of senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers, where Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1) 1st Quarter Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) 2nd Quarter Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) 3rd Quarter Sub-Debt	(8) Senior Debt	(9) Diff (7vs8)
Pre-Risk	0.668***	0.289	0.379	0.819***	0.274	0.545	0.784***	0.361	0.423
	(0.235)	(0.384)		(0.165)	(0.354)		(0.185)	(0.394)	
Bank-Size	0.002	-0.002	0.004*	0.001	-0.002	0.003	0.002	-0.001	0.003
	(0.002)	(0.002)		(0.002)	(0.001)		(0.002)	(0.001)	
ROA	-0.863	-0.660	-0.203	-4.510***	-0.449	-4.061**	-5.447*	-0.546	-4.901
	(0.628)	(0.988)		(1.401)	(0.889)		(3.168)	(0.932)	
Loans-Assets	-0.012	-0.028**	0.015	-0.002	-0.027**	0.025*	0.009	-0.028**	0.037**
	(0.010)	(0.014)		(0.009)	(0.012)		(0.013)	(0.014)	
Buffer	-0.002	-0.178*	0.176	-0.058	-0.188**	0.130	-0.020	-0.159*	0.139
	(0.065)	(0.104)		(0.058)	(0.088)		(0.074)	(0.095)	
Tobin's Q	0.004	0.004*	-0.001	0.008***	0.004*	0.004	0.008*	0.005**	0.004
	(0.003)	(0.002)		(0.003)	(0.002)		(0.004)	(0.002)	
Equity Ratio	0.066	0.058	0.008	0.195*	0.103	0.092	0.172	0.083	0.089
	(0.126)	(0.098)		(0.110)	(0.104)		(0.177)	(0.121)	
Credit Quality	-0.001	-0.008	0.007	0.004	-0.010	0.014	0.003	-0.010	0.013
	(0.003)	(0.009)		(0.004)	(0.008)		(0.005)	(0.009)	
Recession	0.014	0.001	0.013	0.002	-0.006	0.008	-0.005	-0.012**	0.007
	(0.013)	(0.006)		(0.008)	(0.005)		(0.005)	(0.005)	
MES	-0.014	0.045	-0.059	-0.106	0.035	-0.141	-0.087	0.023	-0.110
	(0.144)	(0.149)		(0.117)	(0.118)		(0.131)	(0.100)	
Constant	-0.017	0.051***	-0.069**	-0.018	0.042***	-0.060**	-0.028	0.037**	-0.066**
	(0.023)	(0.019)		(0.021)	(0.016)		(0.031)	(0.016)	
Observations	101	173		101	176		101	177	
R-squared	0.264	0.087		0.514	0.097		0.470	0.102	

Table 4-15 (Continued): Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers

This table presents the estimated linear regression results on the adjusted median Tail Risk of senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers, where Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(10) 1st Year Sub-Debt	(11) Senior Debt	(12) Diff (10vs11)	(13) 2nd Year Sub-Debt	(14) Senior Debt	(15) Diff (13vs14)	(16) Over 2 Years Sub-Debt	(17) Senior Debt	(18) Diff (16vs17)
Pre-Risk	0.817***	0.428	0.389	0.986***	0.338	0.648	1.049***	0.784**	0.265
	(0.138)	(0.437)		(0.166)	(0.475)		(0.299)	(0.326)	
Bank-Size	0.001	-0.001	0.002	0.000	0.001	-0.001	0.001	0.000	0.001
	(0.002)	(0.001)		(0.002)	(0.002)		(0.002)	(0.001)	
ROA	-4.577	-0.830	-3.747	-5.950	0.884	-6.834*	-5.413	-0.795	-4.618
	(2.864)	(0.930)		(3.929)	(0.979)		(3.324)	(0.723)	
Loans-Assets	0.004	-0.039**	0.043**	0.005	-0.038	0.042	0.015	-0.002	0.017
	(0.012)	(0.017)		(0.016)	(0.025)		(0.013)	(0.010)	
Buffer	-0.051	-0.174	0.123	-0.051	-0.129	0.078	0.037	-0.062	0.099
	(0.075)	(0.107)		(0.103)	(0.126)		(0.071)	(0.075)	
Tobin's Q	0.009**	0.005**	0.003	0.009	-0.003	0.012*	0.012**	0.001	0.010**
	(0.004)	(0.002)		(0.006)	(0.003)		(0.005)	(0.002)	
Equity Ratio	0.128	0.101	0.027	0.085	0.041	0.044	0.172	0.077	0.095
	(0.164)	(0.113)		(0.209)	(0.169)		(0.188)	(0.072)	
Credit Quality	0.004	-0.012	0.016	0.012*	-0.015	0.028*	0.010**	-0.017**	0.028***
	(0.005)	(0.010)		(0.007)	(0.014)		(0.005)	(0.008)	
Recession	-0.003	-0.014**	0.010	-0.008	-0.010*	0.001	-0.015	-0.008**	-0.006
	(0.005)	(0.005)		(0.006)	(0.006)		(0.010)	(0.004)	
MES	-0.065	0.026	-0.091	-0.301**	-0.231	-0.070	-0.060	-0.156	0.096
	(0.119)	(0.118)		(0.133)	(0.155)		(0.090)	(0.106)	
Constant	-0.016	0.042**	-0.058*	-0.004	0.039*	-0.043	-0.038	0.013	-0.052
	(0.028)	(0.017)		(0.038)	(0.022)		(0.035)	(0.012)	
Observations	101	177		96	149		101	177	
R-squared	0.471	0.123		0.420	0.088		0.474	0.243	

Table 4-16: Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers of Risky Banks

This table presents the estimated linear regression results on the adjusted median Tail Risk of risky senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to the issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers, where Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are defined as being Risky if their Tail Risk is at or above the median of the sample distribution. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1) 1st Quarter Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) 2nd Quarter Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) 3rd Quarter Sub-Debt	(8) Senior Debt	(9) Diff (7vs8)
Pre-Risk	0.790***	-0.121	0.911*	0.957***	-0.035	0.992**	0.883***	0.148	0.735
	(0.188)	(0.492)		(0.108)	(0.487)		(0.110)	(0.587)	
Bank-Size	0.004	-0.003	0.007*	0.003	-0.002	0.005	0.005*	-0.003	0.008**
	(0.003)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)	
ROA	-2.176**	-0.738	-1.438	-6.806***	-0.595	-6.211***	-8.887**	-0.835	-8.052**
	(0.813)	(1.084)		(0.988)	(0.977)		(3.404)	(1.031)	
Loans-Assets	-0.074	-0.057*	-0.017	-0.041	-0.058**	0.017	-0.001	-0.065**	0.064*
	(0.054)	(0.031)		(0.026)	(0.029)		(0.022)	(0.030)	
Buffer	-0.079	-0.256	0.177	-0.154*	-0.295	0.141	-0.062	-0.347*	0.285
	(0.154)	(0.191)		(0.090)	(0.178)		(0.073)	(0.206)	
Tobin's Q	0.009**	0.005	0.004	0.015***	0.005	0.010***	0.019***	0.007**	0.012*
	(0.004)	(0.004)		(0.003)	(0.003)		(0.006)	(0.003)	
Equity Ratio	0.117	0.141	-0.024	0.283**	0.204	0.079	0.330	0.216	0.114
	(0.215)	(0.124)		(0.128)	(0.140)		(0.218)	(0.167)	
Credit Quality	0.003	-0.010	0.013	0.007	-0.014	0.021	0.003	-0.016	0.019
	(0.005)	(0.015)		(0.005)	(0.014)		(0.007)	(0.015)	
Recession	0.038***	-0.000	0.038***	0.019***	-0.007	0.026***	0.004	-0.012*	0.016*
	(0.009)	(0.007)		(0.006)	(0.006)		(0.009)	(0.006)	
MES	-0.192	-0.082	-0.110	-0.293	-0.070	-0.223	-0.306	-0.073	-0.233
	(0.402)	(0.223)		(0.235)	(0.177)		(0.198)	(0.152)	
Constant	-0.008	0.077*	-0.085*	-0.021	0.067*	-0.089**	-0.066	0.077*	-0.143***
	(0.036)	(0.043)		(0.028)	(0.037)		(0.043)	(0.039)	
Observations	46	88		46	89		46	89	
R-squared	0.468	0.107		0.761	0.143		0.718	0.182	

Table 4-16 (Continued): Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers of Risky Banks

This table presents the estimated linear regression results on the adjusted median Tail Risk of risky senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to the issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers, where Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are defined as being Risky if their Tail Risk is at or above the median of the sample distribution. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(10) 1st Year Sub-Debt	(11) Senior Debt	(12) Diff (10vs11)	(13) 2nd Year Sub-Debt	(14) Senior Debt	(15) Diff (13vs14)	(16) Over 2 Years Sub-Debt	(17) Senior Debt	(18) Diff (16vs17)
Pre-Risk	0.920***	0.412	0.508	1.053***	0.820	0.233	1.110***	0.994**	0.116
	(0.097)	(0.640)		(0.145)	(0.630)		(0.255)	(0.497)	
Bank-Size	0.003	-0.004	0.007**	0.003	-0.005*	0.008**	0.006*	-0.001	0.007**
	(0.002)	(0.003)		(0.003)	(0.003)		(0.003)	(0.002)	
ROA	-7.787**	-1.144	-6.643**	-9.925**	0.202	-10.13**	-8.052**	-0.517	-7.535**
	(3.098)	(0.983)		(4.520)	(0.767)		(3.616)	(0.846)	
Loans-Assets	-0.007	-0.095**	0.088**	0.001	-0.065	0.066	0.015	-0.015	0.030
	(0.020)	(0.038)		(0.027)	(0.041)		(0.031)	(0.025)	
Buffer	-0.077	-0.499**	0.422*	-0.029	-0.616**	0.587**	0.097	-0.216	0.313*
	(0.080)	(0.234)		(0.085)	(0.249)		(0.084)	(0.177)	
Tobin's Q	0.019***	0.009**	0.010*	0.020**	0.005	0.015*	0.018**	0.002	0.016**
	(0.005)	(0.004)		(0.009)	(0.004)		(0.007)	(0.003)	
Equity Ratio	0.270	0.270*	0.000	0.331	0.241*	0.090	0.291	0.059	0.232
	(0.203)	(0.156)		(0.257)	(0.139)		(0.274)	(0.115)	
Credit Quality	0.004	-0.019	0.023	0.009	-0.032	0.041*	0.005	-0.023*	0.028*
	(0.007)	(0.017)		(0.008)	(0.023)		(0.008)	(0.014)	
Recession	0.007	-0.013*	0.020**	0.006	-0.000	0.006	-0.033***	-0.007	-0.026***
	(0.008)	(0.007)		(0.011)	(0.006)		(0.009)	(0.005)	
MES	-0.260	-0.042	-0.218	-0.335	-0.040	-0.295	0.200	-0.213	0.413
	(0.180)	(0.167)		(0.257)	(0.245)		(0.265)	(0.158)	
Constant	-0.047	0.105**	-0.152***	-0.058	0.119**	-0.177***	-0.102*	0.051	-0.153***
	(0.040)	(0.043)		(0.052)	(0.048)		(0.054)	(0.035)	
Observations	46	89		44	70		46	89	
R-squared	0.724	0.231		0.699	0.312		0.673	0.290	

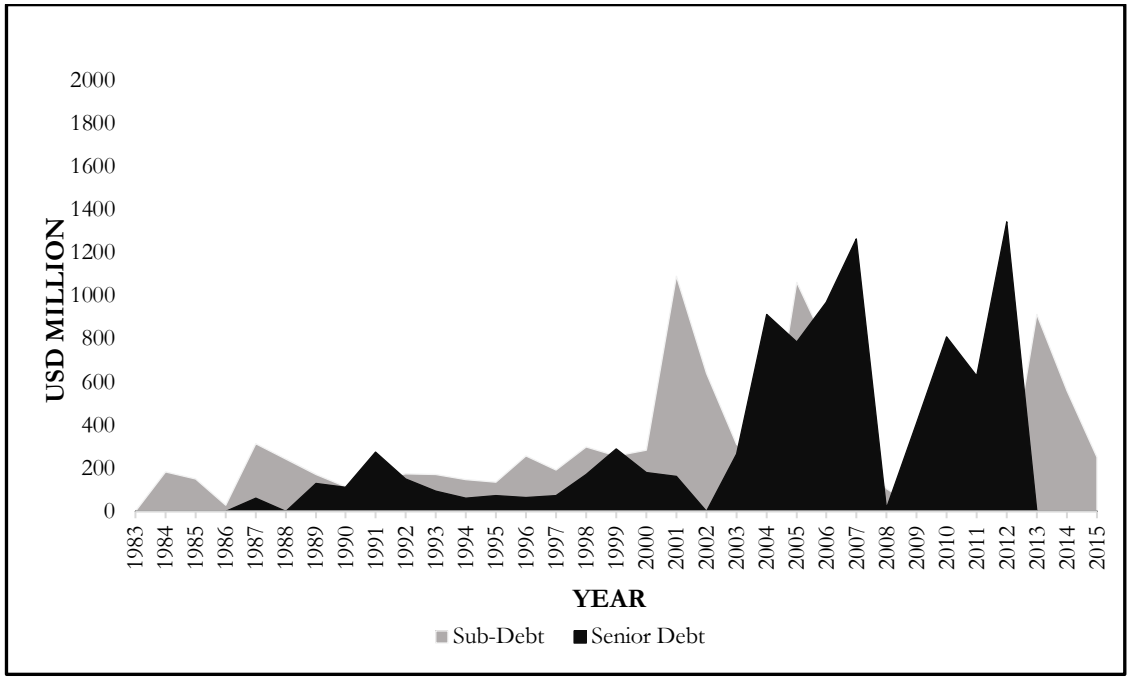

Figure 4-1: Average Proceeds from Senior and Sub-Debt Offers

This graph presents the annual average amount raised from senior and sub-debt offers for the period 1983 to 2015.

Additional Tables - Chapter 4

Table A.4-1: Description of the Sample - Short Term Analysis

This table describes the sampling criteria for the short-term analysis of sub-debt and senior debt announcements over the sample period 1983 to 2015.

Sampling Criteria	Sub-Debt		Senior Debt	
	Issues	Issuers	Issues	Issuers
Senior debt issues by banks	N/A	N/A	33386	2274
Sub-debt issues by all financial institutions	4604	1725	N/A	N/A
Retain straight senior debt i.e. non-hybrid issues, exclude; swaps, deposits, bank notes, commercial paper, mortgage bonds, loans or leases etc.[38]	N/A	N/A	6151	686
Retain issues by banks in Compustat-Capital IQ	773	231	2347	163
Retain issues with file (announcement) dates	591	181	1178	64
Retain issues with accounting data	545	151	1100	56
Drop contemporaneous announcements within the maximum event window [-1,1]	365	142	398	43
Drop announcements coinciding with issuance within the [-1,1] event window	360	140	396	43
Retain issues with stock information in CRSP	342	130	380	41
Retain events with sufficient observations in the [-1,1] event window	337	127	380	41
Retain events with sufficient observations in the estimation window [20,120]	310	116	363	40
Final Sample	**310**	**116**	**363**	**40**

[38] More precisely, the screening retains; Adjustable Rate Bonds, Extendible Floating Rate Bonds, Bonds, Debentures, Debt, Debt Financing, Global Bonds, Fixed / Straight Bond, Fixed/Floating Rate Bonds, Senior Debt, Floating Rate Bonds, Floating Rate Debentures, Senior Bonds, Floating Rate Guaranteed Bonds, Floating Rate Senior Bonds, Floating Rate Unsecured Bonds, Guaranteed Bonds, Unsecured Bond, Guaranteed Global Bonds, Senior Debentures, Step-Up Bonds, Zero Coupon Bonds, Adjustable Rate Notes, Discount Notes, Capped Floating Rate Notes, Fixed/Floating Rate Medium Term Notes, Fixed/Floating Rate Notes, Floating Rate Guaranteed Medium Term Notes, Floating Rate Notes, Floating Rate Senior Notes, General Term Notes, Global Floating Rate Notes, Global Medium-Term Notes, Global Notes, Guaranteed Global Notes, Guaranteed Medium-Term Notes, Guaranteed Notes, Guaranteed Senior Notes, Guaranteed Senior Unsecured Notes, Medium-Term Notes, Medium-Term Floating Rate Notes, Medium-Term Senior Notes, Notes, Secured Notes, Senior Secured Floating Rate Notes, Senior Notes, Senior Medium Term Notes, Senior Secured Notes, Senior Unsecured Notes, Step-Down Floating Rate Notes, Step-Up Callable Notes, Step-Up Notes, Step-Up Floating Rate Notes, Step-Up Medium Term Notes, Term Notes, Variable Rate Notes, Yield Curve Notes, Zero Coupon Notes, Zero Coupon Medium Term Notes, Amortizing Floating Rate Notes, Amortizing Notes, Auction Rate Notes, Extendible Floating Rate Senior Notes, Extendible Notes, Floating Rate Extendible Notes and Senior Extendible Notes.

Table A.4-2: Description of the Sample - Long Term Analysis

This table describes the sampling criteria for the long-term analysis of sub-debt and senior debt issuances over the sample period 1983 to 2015.

Sampling Criteria	Sub-Debt		Senior Debt	
	Issues	Issuers	Issues	Issuers
Senior debt issues by banks	N/A	N/A	33386	2274
Sub-debt issues by all financial institutions	4604	1725	N/A	N/A
Retain straight Senior debt i.e. non-hybrid issues, exclude; swaps, deposits, bank notes, commercial paper, mortgage bonds, loans or leases etc.	N/A	N/A	6151	686
Retain 1 same-security issue per quarter	3000	1725	2576	686
Drop cross-security issues within a quarter	2682	1691	2250	669
Retain Compustat-Bank issues	434	210	679	152
Drop cross-security issues within 2 years	317	188	505	138
Drop securities without data in the pre- and post-period analysis i.e. pre-1984 and post 2013	265	151	444	123
Retain issues with accounting data	211	106	383	98
Final Sample	**211**	**106**	**383**	**98**

Table A.4-3: Abnormal Stock Returns for Senior and Sub-Debt Offers - Longer Event Windows

This table presents the cumulative announcement returns (CAR), in percent, of senior and sub-debt offers for the respective event window over the sample period 1983 to 2015. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Market Model - Longer Event Windows Sub-Debt	(2) Senior Debt	(3) Diff (1 vs 2)
CAR [-1, 0]	Mean	-0.12	0.51***	-0.63***
	Median	-0.13	0.67***	-0.80***
CAR [-1, 1]	Mean	-0.24	0.45**	-0.69***
	Median	-0.15	0.42***	-0.57***
CAR [-2, 2]	Mean	-0.40*	1.09***	-1.48***
	Median	-0.10	0.52***	-0.62***
CAR [-3, 3]	Mean	-0.19	1.38***	-1.58***
	Median	-0.10	0.62**	-0.72***
Observations[39]		298	361	

[39] For this test, the sample was screened for contemporaneous announcements within the maximum event window [-3,3], resulting in lower observations than in the main test.

Table A.4-4: Abnormal Stock Returns for Eligible Sub-Debt and Senior Debt Offers

This table presents the cumulative announcement returns (CAR), in percent, of eligible sub-debt and senior debt for the event windows [-1,0] and [-1,1] over the sample period 1983 to 2015. Eligible sub-debt offers are those that meet the minimum criteria for inclusion as regulatory capital and/or the issuer is still within the regulatory Tier 2 quota. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Sub-Debt	(2) Senior Debt	(3) Diff (1 vs 2)
CAR [-1, 0]	Mean	0.06	0.50***	-0.44**
	Median	0.07	0.65***	-0.58**
CAR [-1, 1]	Mean	-0.06	0.44**	-0.50*
	Median	-0.05	0.42***	-0.97**
Observations		208	363	

Table A.4-5: Abnormal Stock Returns by Bank Capitalization - Only Eligible Sub-Debt Offers

This table presents the cumulative announcement returns (CAR), in percent, of eligible sub-debt and senior debt offers for Less- and Well-Capitalized banks over for the event windows [-1,0] and [-1,1]. The sample period runs from 1983 to 2015. Eligible sub-debt offers are those that meet the minimum criteria for inclusion as regulatory capital and/or the issuer is still within the regulatory Tier 2 quota. Banks are Less-Capitalized if their buffer falls below the median of the sample distribution, otherwise they are classified as being Well-Capitalized, where buffer is the actual regulatory capital adequacy ratio less the minimum required. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Less-Capitalized Banks Sub-Debt	(2) Less-Capitalized Banks Senior Debt	(3) Diff (1 vs 2)	(4) Well-Capitalized Banks Sub-Debt	(5) Well-Capitalized Banks Senior Debt	(6) Diff (4 vs 5)	(7) Diff (1 vs 4)	(8) Diff (2 vs 5)
CAR [-1, 0]	Mean	0.08	0.91***	-0.83**	0.00	0.24	-0.24	0.08	0.68**
	Median	0.07	1.26***	-1.19***	0.36	0.31*	0.05	-0.29	0.95***
CAR [-1, 1]	Mean	0.01	0.41	-0.40	-0.20	0.46**	-0.66*	0.21	-0.05
	Median	-0.15	0.53**	-0.68**	0.13	0.33**	-0.20	-0.28	0.20
Observations		138	140		70	223			

Table A.4-6: Abnormal Stock Returns of Small Banks by Risk Levels

This table presents the cumulative announcement returns (CAR), in percent, of senior and sub-debt offers of Small banks across risk levels. The CARs are calculated over the event windows [-1,0] and [-1,1] for the sample period 1983 to 2015. Banks are Small if the logarithm of their assets falls below the median of the sample distribution. Less-Risky banks are those with Tail Risk below the median of the sample distribution, otherwise they are classified as being Risky, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Risky Banks Sub-Debt	(2) Senior Debt	(3) Diff (1 vs 2)	(4) Less-Risky Banks Sub-Debt	(5) Senior Debt	(6) Diff (4 vs 5)	(7) Diff (1 vs 4)	(8) Diff (2 vs 5)
CAR [-1, 0]	Mean	-0.14	-0.41	0.27	-0.05	0.40**	-0.445	-0.09	-0.81*
	Median	-0.17	-0.02	-0.15	-0.16	0.22	-0.38*	-0.01	-0.24
CAR [-1, 1]	Mean	-0.40	-0.20	-0.20	0.05	1.03***	-0.98**	-0.45	-1.23***
	Median	-0.34	-0.16	-0.14	0.16	0.80***	-0.64***	-0.50	-0.96***
Observations		88	66		115	65			

Table A.4-7: Abnormal Stock Returns of Well-Capitalized Banks by Risk Levels

This table presents the cumulative announcement returns (CAR), in percent, of senior and sub-debt offers of Well-Capitalized banks across risk levels. The CARs are calculated over the event windows [-1,0] and [-1,1] for the sample period 1983 to 2015. Banks are Well-Capitalized if their buffer is at or above the median of the sample distribution, where buffer is the actual regulatory capital adequacy ratio less the minimum required. Less-Risky banks are those with Tail Risk below the median of the sample distribution otherwise they are classified as being Risky, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Announcement Window		(1) Risky Banks Sub-Debt	(2) Senior Debt	(3) Diff (1 vs 2)	(4) Less-Risky Banks Sub-Debt	(5) Senior Debt	(6) Diff (4 vs 5)	(7) Diff (1 vs 4)	(8) Diff (2 vs 5)
CAR [-1, 0]	Mean	-0.02	0.40	-0.42	-0.23	-0.01	-0.22	0.21	0.41
	Median	-0.17	0.82***	-0.99	0.09	0.20	-0.11	-0.26	0.62
CAR [-1, 1]	Mean	-0.38	0.67**	-1.04	-0.15	0.16	-0.31	-0.23	0.51
	Median	-0.32	0.24	-0.56	-0.76	0.47**	-1.23	0.44	-0.23
Observations		37	133		81	90			

Table A.4-8: Relationship between Abnormal Stock Returns and Tail Risk - Based on Bank Size

This table reports the relationship between abnormal stock returns and Tail Risk of senior and sub-debt announcements for Large and Small banks over the sample period 1983 to 2015. The results are estimated using a linear regression model with the cumulative abnormal returns over the event window [-1,1] as the dependent variable. Banks are Small if the logarithm of their assets fall below the median of the sample distribution otherwise they are classified as being Large. Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Bank-Size is the logarithm of total assets while Issue-Size is the logarithm of the amount raised; Debt Quality is a dummy variable equal to 1 for debt issues with a S&P rating of BBB- or better, or 0 otherwise; Maturity is the logarithm of years to maturity; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Free-Cash Flow is the ratio of operating cash to total assets; Tax is the ratio of taxes to pre-tax earnings; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall, the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns; Crisis is a dummy variable equal to 1 for periods falling within banking crisis periods as identified by Liu and Ngo (2014), or 0 otherwise; Dodd-Frank is a dummy variable equal to 1 for the periods after the implementation of the Dodd-Frank Act in July 2010 (inclusive), or 0 otherwise. Bank-Size, Issue-Size and Maturity are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1) Large Banks Sub-Debt	(2) Senior Debt	(3) Diff(1vs2)	(4) Small Banks Sub-Debt	(5) Senior Debt	(6) Diff(4vs5)	(7) Large Vs Small Banks Diff(1vs4)	(8) Diff(2vs5)
Tail Risk	-0.406	3.148***	-3.554***	-0.305	0.230	0.535	0.101	2.918***
	(0.316)	(0.266)		(0.234)	(0.379)			
Buffer	-0.048	0.508***	-0.556**	-0.063	-0.068	0.005	0.015	0.576***
	(0.250)	(0.157)		(0.124)	(0.159)			
Bank-Size	0.016	0.008	0.008	-0.002	-0.001	-0.001	0.018	0.009
	(0.013)	(0.014)		(0.003)	(0.004)			
Issue-Size	-0.000	0.007***	-0.007**	-0.001	0.007**	-0.008**	0.001	0.000
	(0.003)	(0.001)		(0.003)	(0.003)			
Debt Quality	0.024**	0.033***	-0.009	0.001	-0.001	0.002	0.023**	0.034**
	(0.009)	(0.007)		(0.006)	(0.013)			
Maturity	0.001	-0.002	0.003	-0.001	0.002	-0.003	0.002	-0.004
	(0.002)	(0.002)		(0.001)	(0.003)			
Tobin's Q	0.019***	-0.008*	0.027***	0.008**	0.002	0.006	0.011	-0.010
	(0.007)	(0.005)		(0.004)	(0.007)			
Equity Ratio	0.114	-0.043	0.157	-0.222	-0.353	0.131	0.336	0.310
	(0.166)	(0.165)		(0.156)	(0.226)			
Free-Cash Flow	-0.383	2.110**	-2.493	-1.951*	-0.882	-1.069	1.568	2.992**
	(1.598)	(0.876)		(1.116)	(0.996)			
Tax	-0.043	-0.362***	0.319***	0.076**	0.044	0.032	-0.119**	-0.406***
	(0.050)	(0.064)		(0.035)	(0.076)			
Recession	0.022**	0.068***	-0.046***	-0.000	-0.010	0.010	0.022	0.078***
	(0.008)	(0.012)		(0.014)	(0.020)			
MES	-0.013	-2.888***	2.875***	0.183	-0.499	0.682	-0.196	-2.389***
	(0.294)	(0.359)		(0.222)	(0.378)			
Crisis	0.001	-0.089***	0.090***	0.010*	-0.008	0.018*	-0.009	-0.081***
	(0.009)	(0.019)		(0.006)	(0.010)			
Dodd-Frank	0.006	-0.114***	0.120***	0.004	0.016	-0.012	0.002	-0.130***
	(0.012)	(0.014)		(0.007)	(0.017)			
Constant	-0.220	-0.093		0.020	-0.005			
	(0.174)	(0.162)		(0.025)	(0.055)			
Observations	107	232		201	131			
R-squared	0.399	0.641		0.089	0.277			

Table A.4-9: Relationship between Abnormal Stock Returns and Tail Risk - Based on Bank Capitalization

This table reports the relationship between abnormal stock returns and Tail Risk of senior and sub-debt announcements for Less- and Well-Capitalized banks over the sample period 1983 to 2015. The results are estimated using a linear regression model with the cumulative abnormal returns over the event window [-1,1] as the dependent variable. Banks are Less-Capitalized if their buffer falls below the median of the sample distribution otherwise they are classified as being Well-Capitalized. Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Bank-Size is the logarithm of total assets while Issue-Size is the logarithm of the amount raised; Debt Quality is a dummy variable equal to 1 for debt issues with a S&P rating of BBB- or better, or 0 otherwise; Maturity is the logarithm of years to maturity; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Free-Cash Flow is the ratio of operating cash to total assets; Tax is the ratio of taxes to pre-tax earnings; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall, the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns; Crisis is a dummy variable equal to 1 for periods falling within banking crisis periods as identified by Liu and Ngo (2014), or 0 otherwise; Dodd-Frank is a dummy variable equal to 1 for the periods after the implementation of the Dodd-Frank Act in July 2010 (inclusive), or 0 otherwise. Bank-Size, Issue-Size and Maturity are in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regression	Less-Capitalized Banks			Well-Capitalized Banks			Less- Vs Well-Capitalized	
Analysis	Sub-Debt	Senior Debt	Diff(1vs2)	Sub-Debt	Senior Debt	Diff(4vs5)	Diff(1vs4)	Diff(2vs5)
Tail Risk	-0.390	2.608***	-2.998***	-0.515*	0.395	-0.910*	0.125	2.213***
	(0.279)	(0.403)		(0.296)	(0.458)			
Buffer	-0.119	-1.034	0.915	0.079	-0.134	0.213	-0.198	-0.900
	(0.193)	(0.966)		(0.106)	(0.350)			
Bank-Size	-0.000	0.007	-0.007	-0.008***	0.011***	-0.019***	0.008**	-0.004
	(0.002)	(0.011)		(0.002)	(0.003)			
Issue-Size	-0.003	0.012***	-0.015***	0.006**	-0.006*	0.012***	-0.009**	0.018***
	(0.003)	(0.002)		(0.003)	(0.003)			
Debt Quality	0.002	0.021	-0.019	0.015	0.020	-0.005	-0.013	0.001
	(0.007)	(0.018)		(0.009)	(0.030)			
Maturity	0.000	-0.007**	0.007**	-0.006**	0.003	-0.009**	0.006**	-0.010**
	(0.001)	(0.003)		(0.003)	(0.003)			
Tobin's Q	0.016***	-0.015**	0.031***	0.003	-0.017*	0.020*	0.013*	0.002
	(0.005)	(0.006)		(0.005)	(0.010)			
Equity Ratio	-0.206	0.562	-0.768	-0.364**	-0.049	-0.315	0.158	0.611
	(0.168)	(0.466)		(0.146)	(0.211)			
Free-Cash Flow	-0.111	-3.708*	3.597*	-3.516	2.741	-6.257**	3.405	-6.449***
	(0.898)	(1.881)		(2.352)	(1.800)			
Tax	0.061*	-0.233**	0.294***	0.022	-0.000	0.022	0.039	-0.233**
	(0.036)	(0.089)		(0.040)	(0.061)			
Recession	0.009	-0.074***	0.083***	0.002	-0.011	0.013	0.007	-0.063***
	(0.013)	(0.013)		(0.007)	(0.013)			
MES	-0.214	-2.169***	1.955***	0.383	-0.512	0.895*	-0.597	-1.657***
	(0.310)	(0.404)		(0.260)	(0.470)			
Crisis	0.009	-0.046*	0.055**	0.036	0.022	0.014	-0.027	-0.068**
	(0.005)	(0.027)		(0.022)	(0.023)			
Dodd-Frank	0.006	0.000	0.006	0.004	-0.020*	0.024*	0.002	0.020*
	(0.009)	(0.000)		(0.006)	(0.012)			
Constant	-0.001	-0.053		0.091***	-0.072			
	(0.026)	(0.113)		(0.032)	(0.072)			
Observations	190	140		118	223			
R-squared	0.156	0.709		0.253	0.168			

Table A.4-10: Adjusted Post-issuance Tail Risk of Senior and Sub-Debt Issuers

This table presents the adjusted Tail Risk, in percent, of senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the Tail Risk of sub-debt issuers at the end of the post-issuance periods. Reciprocally, the adjusted Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers. Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. The mean and median coefficients are estimated with robust standard errors, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Post Issuance Period		(1) Quartile Matching Sub-Debt	(2) Quartile Matching Senior Debt	(3) Diff(1vs2)	(4) Quintile Matching Sub-Debt	(5) Quintile Matching Senior Debt	(6) Diff(4vs5)	(7) Decile Matching Sub-Debt	(8) Decile Matching Senior Debt	(9) Diff(7vs8)
Quarter 1	Mean	-0.26	0.63***	-0.89***	-0.20	0.61***	-0.81***	-0.04	0.62***	-0.66**
	Median	-0.25	0.25**	-0.50***	-0.28	0.27**	-0.55***	-0.15	0.24	-0.39**
	N	102	177		83	166		51	105	
Quarter 2	Mean	0.25	0.50***	-0.25	0.01	0.47***	-0.46	-0.03	0.44***	-0.47
	Median	-0.17	0.11	-0.28	-0.23	-0.05	-0.18*	-0.17	0.06	-0.23*
	N	101	173		82	163		50	103	
Quarter 3	Mean	0.01	0.84***	-0.83**	-0.36**	0.87***	-1.23***	-0.28	0.68***	-0.96***
	Median	-0.08	0.16	-0.24**	-0.34*	0.16	-0.50***	-0.43**	0.21	-0.64***
	N	99	168		79	158		49	98	
Quarter 4	Mean	0.16	1.02***	-0.86**	-0.17	0.92***	-1.09***	-0.20	1.16***	-1.36***
	Median	-0.18	0.07	-0.25**	-0.37*	0.05	-0.42**	-0.30	0.15	-0.45***
	N	97	157		79	148		48	92	
Quarter 8	Mean	0.01	1.21***	-1.20***	0.14	1.00***	-0.86*	0.28	1.08***	-0.80
	Median	-0.20	0.57***	-0.77***	-0.28	0.33*	-0.61**	-0.19	0.48**	-0.67**
	N	91	138		76	132		45	83	

Table A.4-11: Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers of Less-Risky Banks

This table presents the estimated linear regression results on the adjusted median Tail Risk of less-risky senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers, where Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are Less-Risky if their Tail Risk is below the median of the sample distribution. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1) 1st Quarter Sub-Debt	(2) Senior Debt	(3) Diff (1vs2)	(4) 2nd Quarter Sub-Debt	(5) Senior Debt	(6) Diff (4vs5)	(7) 3rd Quarter Sub-Debt	(8) Senior Debt	(9) Diff (7vs8)
Pre-Risk	0.845***	0.802***	0.043	0.374	0.644***	-0.270	0.467	0.453***	0.014
	(0.239)	(0.212)		(0.248)	(0.152)		(0.281)	(0.150)	
Bank-Size	-0.001	-0.002	0.001	-0.001	-0.002	0.001	-0.002	-0.002*	0.000
	(0.001)	(0.001)		(0.001)	(0.001)		(0.002)	(0.001)	
ROA	-0.600	-0.494	-0.106	-0.735	-0.322	-0.413	0.504	0.322	0.182
	(1.361)	(0.636)		(1.412)	(0.587)		(1.168)	(0.720)	
Loans-Assets	-0.001	0.009	-0.010	-0.001	0.012	-0.013	-0.002	0.014	-0.016
	(0.010)	(0.016)		(0.010)	(0.012)		(0.010)	(0.011)	
Buffer	0.081	-0.035	0.116	-0.040	-0.032	-0.008	-0.082	0.050	-0.132
	(0.076)	(0.086)		(0.073)	(0.061)		(0.068)	(0.062)	
Tobin's Q	0.004	0.000	0.004	0.002	-0.001	0.003	0.001	-0.001	0.002
	(0.004)	(0.002)		(0.003)	(0.002)		(0.004)	(0.002)	
Equity Ratio	-0.033	-0.285*	0.252	-0.029	-0.267**	0.238	-0.105	-0.347**	0.242
	(0.112)	(0.160)		(0.095)	(0.127)		(0.099)	(0.132)	
Credit Quality	-0.001	0.003	-0.004	0.001	0.003	-0.002	-0.001	0.004	-0.005
	(0.003)	(0.005)		(0.004)	(0.004)		(0.004)	(0.003)	
Recession	-0.009**	-0.006*	-0.003	-0.014***	-0.012***	-0.002	-0.013***	-0.017***	0.004
	(0.004)	(0.004)		(0.003)	(0.003)		(0.003)	(0.003)	
MES	0.085	0.079	0.006	0.103	0.059	0.044	0.109	0.190*	-0.081
	(0.077)	(0.099)		(0.076)	(0.093)		(0.089)	(0.100)	
Constant	0.009	0.036**	-0.027	0.018	0.028**	-0.010	0.025	0.029**	-0.004
	(0.018)	(0.017)		(0.016)	(0.013)		(0.018)	(0.013)	
Observations	55	85		55	87		55	88	
R-squared	0.314	0.317		0.221	0.324		0.304	0.309	

Table A.4-11 (Continued): Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior and Sub-Debt Issuers of Less-Risky Banks

This table presents the estimated linear regression results on the adjusted median Tail Risk of less-risky senior and sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods. Reciprocally, the adjusted median Tail Risk for senior debt subtracts the prior year median Tail Risk of sub-debt issuers, where Tail Risk is measured as the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are Less-Risky if their Tail Risk is below the median of the sample distribution. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(10) 1st Year Sub-Debt	(11) Senior Debt	(12) Diff (10vs11)	(13) 2nd Year Sub-Debt	(14) Senior Debt	(15) Diff (13vs14)	(16) Over 2 Years Sub-Debt	(17) Senior Debt	(18) Diff (16vs17)
Pre-Risk	0.337	0.470**	-0.133	0.294	1.100***	-0.806	0.398	0.462***	-0.064
	(0.303)	(0.198)		(0.639)	(0.399)		(0.382)	(0.170)	
Bank-Size	-0.001	-0.001	0.000	-0.002	0.004**	-0.006**	-0.004***	0.000	-0.004***
	(0.002)	(0.001)		(0.003)	(0.002)		(0.001)	(0.001)	
ROA	0.893	0.010	0.883	0.889	1.391	-0.502	0.686	-0.621	1.307
	(1.242)	(0.867)		(1.719)	(2.321)		(1.005)	(0.587)	
Loans-Assets	0.001	0.008	-0.007	0.008	-0.028	0.036	-0.011	0.002	-0.013
	(0.011)	(0.013)		(0.016)	(0.048)		(0.009)	(0.007)	
Buffer	-0.111	0.089	-0.200**	-0.246*	0.095	-0.341*	-0.137*	0.040	-0.177**
	(0.076)	(0.068)		(0.135)	(0.148)		(0.072)	(0.051)	
Tobin's Q	-0.001	-0.001	0.000	0.000	-0.009	0.009	0.004	0.002	0.002
	(0.004)	(0.003)		(0.006)	(0.007)		(0.004)	(0.002)	
Equity Ratio	-0.140	-0.301**	0.161	-0.306	0.014	-0.320	-0.102	0.049	-0.151
	(0.106)	(0.143)		(0.225)	(0.460)		(0.104)	(0.083)	
Credit Quality	0.000	0.002	-0.002	0.012	-0.003	0.015*	0.008*	-0.008**	0.016***
	(0.005)	(0.003)		(0.008)	(0.005)		(0.004)	(0.004)	
Recession	-0.010***	-0.010***	0.000	-0.021***	-0.016**	-0.005	-0.001	-0.004*	0.003
	(0.003)	(0.003)		(0.004)	(0.007)		(0.002)	(0.002)	
MES	0.120	0.201*	-0.081	-0.130	-0.058	-0.072	-0.025	0.002	-0.027
	(0.096)	(0.118)		(0.144)	(0.216)		(0.081)	(0.069)	
Constant	0.023	0.024*	-0.001	0.045	-0.010	0.055	0.043**	0.001	0.042**
	(0.019)	(0.013)		(0.040)	(0.026)		(0.017)	(0.010)	
Observations	55	88		52	79		55	88	
R-squared	0.283	0.250		0.289	0.129		0.243	0.176	

Table A.4-12: Regression Results on the Adjusted Post-issuance Median Tail Risk of Sub-Debt Issuers by Risk Levels

This table presents the estimated linear regression results on the adjusted median Tail Risk of risky and less-risky sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are Less-Risky if their Tail Risk falls below the median of the sample distribution otherwise are defined as being Risky. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1) 1st Quarter Risky	(2) Less-Risky	(3) Diff (1vs2)	(4) 2nd Quarter Risky	(5) Less-Risky	(6) Diff (4vs5)	(7) 3rd Quarter Risky	(8) Less-Risky	(9) Diff (7vs8)
Pre-Risk	0.790***	0.845***	-0.055	0.957***	0.374	0.583**	0.883***	0.467	0.416
	(0.188)	(0.239)		(0.108)	(0.248)		(0.110)	(0.281)	
Bank-Size	0.004	-0.001	0.005*	0.003	-0.001	0.004*	0.005*	-0.002	0.007**
	(0.003)	(0.001)		(0.002)	(0.001)		(0.002)	(0.002)	
ROA	-2.176**	-0.600	-1.576	-6.806***	-0.735	-6.071***	-8.887**	0.504	-9.391***
	(0.813)	(1.361)		(0.988)	(1.412)		(3.404)	(1.168)	
Loans-Assets	-0.074	-0.001	-0.073	-0.041	-0.001	-0.040	-0.001	-0.002	0.001
	(0.054)	(0.010)		(0.026)	(0.010)		(0.022)	(0.010)	
Buffer	-0.079	0.081	-0.160	-0.154*	-0.040	-0.114	-0.062	-0.082	0.020
	(0.154)	(0.076)		(0.090)	(0.073)		(0.073)	(0.068)	
Tobin's Q	0.009**	0.004	0.005	0.015***	0.002	0.013***	0.019***	0.001	0.018***
	(0.004)	(0.004)		(0.003)	(0.003)		(0.006)	(0.004)	
Equity Ratio	0.117	-0.033	0.150	0.283**	-0.029	0.312**	0.330	-0.105	0.435**
	(0.215)	(0.112)		(0.128)	(0.095)		(0.218)	(0.099)	
Credit Quality	0.003	-0.001	0.004	0.007	0.001	0.006	0.003	-0.001	0.004
	(0.005)	(0.003)		(0.005)	(0.004)		(0.007)	(0.004)	
Recession	0.038***	-0.009**	0.047***	0.019***	-0.014***	0.033***	0.004	-0.013***	0.017**
	(0.009)	(0.004)		(0.006)	(0.003)		(0.009)	(0.003)	
MES	-0.192	0.085	-0.277	-0.293	0.103	-0.396*	-0.306	0.109	-0.415**
	(0.402)	(0.077)		(0.235)	(0.076)		(0.198)	(0.089)	
Constant	-0.008	0.009	-0.017	-0.021	0.018	-0.039	-0.066	0.025	-0.091**
	(0.036)	(0.018)		(0.028)	(0.016)		(0.043)	(0.018)	
Observations	46	55		46	55		46	55	
R-squared	0.468	0.314		0.761	0.221		0.718	0.304	

Table A.4-12 (Continued): Regression Results on the Adjusted Post-issuance Median Tail Risk of Sub-Debt Issuers by Risk Levels

This table presents the estimated linear regression results on the adjusted median Tail Risk of risky and less-risky sub-debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of sub-debt issuers is calculated by subtracting the median Tail Risk of senior debt issuers in the year prior to issuance of sub-debt from the median Tail Risk of sub-debt issuers over the post-issuance periods, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are Less-Risky if their Tail Risk falls below the median of the sample distribution otherwise are defined as being Risky. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(10) 1st Year Risky	(11) Less-Risky	(12) Diff (10vs11)	(13) 2nd Year Risky	(14) Less-Risky	(15) Diff (13vs14)	(16) Over 2 Years Risky	(17) Less-Risky	(18) Diff (16vs17)
Pre-Risk	0.920***	0.337	0.583**	1.053***	0.294	0.759	1.110***	0.398	0.712*
	(0.097)	(0.303)		(0.145)	(0.639)		(0.255)	(0.382)	
Bank-Size	0.003	-0.001	0.004*	0.003	-0.002	0.005	0.006*	-0.004***	0.010***
	(0.002)	(0.002)		(0.003)	(0.003)		(0.003)	(0.001)	
ROA	-7.787**	0.893	-8.680***	-9.925**	0.889	-10.81**	-8.052**	0.686	-8.738***
	(3.098)	(1.242)		(4.520)	(1.719)		(3.616)	(1.005)	
Loans-Assets	-0.007	0.001	-0.008	0.001	0.008	-0.007	0.015	-0.011	0.026
	(0.020)	(0.011)		(0.027)	(0.016)		(0.031)	(0.009)	
Buffer	-0.077	-0.111	0.034	-0.029	-0.246*	0.217	0.097	-0.137*	0.234**
	(0.080)	(0.076)		(0.085)	(0.135)		(0.084)	(0.072)	
Tobin's Q	0.019***	-0.001	0.020***	0.020**	0.000	0.020**	0.018**	0.004	0.014**
	(0.005)	(0.004)		(0.009)	(0.006)		(0.007)	(0.004)	
Equity Ratio	0.270	-0.140	0.410**	0.331	-0.306	0.637**	0.291	-0.102	0.393
	(0.203)	(0.106)		(0.257)	(0.225)		(0.274)	(0.104)	
Credit Quality	0.004	0.000	0.004	0.009	0.012	-0.003	0.005	0.008*	-0.003
	(0.007)	(0.005)		(0.008)	(0.008)		(0.008)	(0.004)	
Recession	0.007	-0.010***	0.017**	0.006	-0.021***	0.027***	-0.033***	-0.001	-0.032***
	(0.008)	(0.003)		(0.011)	(0.004)		(0.009)	(0.002)	
MES	-0.260	0.120	-0.380**	-0.335	-0.130	-0.205	0.200	-0.025	0.225
	(0.180)	(0.096)		(0.257)	(0.144)		(0.265)	(0.081)	
Constant	-0.047	0.023	-0.069*	-0.058	0.045	-0.102*	-0.102*	0.043**	-0.145***
	(0.040)	(0.019)		(0.052)	(0.040)		(0.054)	(0.017)	
Observations	46	55		44	52		46	55	
R-squared	0.724	0.283		0.699	0.289		0.673	0.243	

Table A.4-13: Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior Debt Issuers by Risk Levels

This table presents the estimated linear regression results on the adjusted median Tail Risk of risky and less-risky senior debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of senior debt issuers is calculated by subtracting the median Tail Risk of sub-debt issuers in the year prior to issuance from the median Tail Risk of senior debt issuers over the post-issuance periods, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are Less-Risky if their Tail Risk falls below the median of the sample distribution otherwise they are defined as being Risky. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(1) 1st Quarter Risky	(2) Less-Risky	(3) Diff (1vs2)	(4) 2nd Quarter Risky	(5) Less-Risky	(6) Diff (4vs5)	(7) 3rd Quarter Risky	(8) Less-Risky	(9) Diff (7vs8)
Pre-Risk	-0.121	0.802***	-0.923*	-0.035	0.644***	-0.679	0.148	0.453***	-0.305
	(0.492)	(0.212)		(0.487)	(0.152)		(0.587)	(0.150)	
Bank-Size	-0.003	-0.002	-0.001	-0.002	-0.002	0.000	-0.003	-0.002*	-0.001
	(0.003)	(0.001)		(0.003)	(0.001)		(0.003)	(0.001)	
ROA	-0.738	-0.494	-0.244	-0.595	-0.322	-0.273	-0.835	0.322	-1.157
	(1.084)	(0.636)		(0.977)	(0.587)		(1.031)	(0.720)	
Loans-Assets	-0.057*	0.009	-0.066**	-0.058**	0.012	-0.070**	-0.065**	0.014	-0.079***
	(0.031)	(0.016)		(0.029)	(0.012)		(0.030)	(0.011)	
Buffer	-0.256	-0.035	-0.221	-0.295	-0.032	-0.263	-0.347*	0.050	-0.397**
	(0.191)	(0.086)		(0.178)	(0.061)		(0.206)	(0.062)	
Tobin's Q	0.005	0.000	0.005	0.005	-0.001	0.006	0.007**	-0.001	0.008**
	(0.004)	(0.002)		(0.003)	(0.002)		(0.003)	(0.002)	
Equity Ratio	0.141	-0.285*	0.426**	0.204	-0.267**	0.471***	0.216	-0.347**	0.563***
	(0.124)	(0.160)		(0.140)	(0.127)		(0.167)	(0.132)	
Credit Quality	-0.010	0.003	-0.013	-0.014	0.003	-0.017	-0.016	0.004	-0.020
	(0.015)	(0.005)		(0.014)	(0.004)		(0.015)	(0.003)	
Recession	-0.000	-0.006*	0.006	-0.007	-0.012***	0.005	-0.012*	-0.017***	0.005
	(0.007)	(0.004)		(0.006)	(0.003)		(0.006)	(0.003)	
MES	-0.082	0.079	-0.161	-0.070	0.059	-0.129	-0.073	0.190*	-0.263
	(0.223)	(0.099)		(0.177)	(0.093)		(0.152)	(0.100)	
Constant	0.077*	0.036**	0.041	0.067*	0.028**	0.039	0.077*	0.029**	0.048
	(0.043)	(0.017)		(0.037)	(0.013)		(0.039)	(0.013)	
Observations	88	85		89	87		89	88	
R-squared	0.107	0.317		0.143	0.324		0.182	0.309	

Table A.4-13 (Continued): Regression Results on the Adjusted Post-issuance Median Tail Risk of Senior Debt Issuers by Risk Levels

This table presents the estimated linear regression results on the adjusted median Tail Risk of risky and less-risky senior debt issuers for the 8-quarters (2 years) post-issuance over the sample period 1984 to 2013. The adjusted median Tail Risk of senior debt issuers is calculated by subtracting the median Tail Risk of sub-debt issuers in the year prior to issuance from the median Tail Risk of senior debt issuers over the post-issuance periods, where Tail Risk is the average equity loss when a bank's returns are in the lower 5th percentile of the quarterly distribution of its daily stock returns. Banks are Less-Risky if their Tail Risk falls below the median of the sample distribution otherwise they are defined as being Risky. Pre-Risk is the adjusted median Tail Risk in the year prior issuance; Bank-Size is the logarithm of total assets; ROA is the ratio of pre-tax earnings to total assets; Loans-Assets is the ratio of total loans to total assets; Buffer is the actual regulatory capital adequacy ratio less the minimum required; Tobin's Q is the market value of equity divided by its book value; Equity Ratio is primary or Tier 1 capital divided by total assets; Credit Quality is a dummy variable equal to 1 for issuers with a S&P rating of BBB- or better, or 0 otherwise; Recession is a dummy variable equal to 1 for recessionary periods as reported by the National Bureau of Economic Research (NBER), or 0 otherwise; MES is marginal expected shortfall - the average equity loss when the market returns are in the lower 5th percentile of the quarterly distribution of daily stock returns. Bank-Size is in logarithmic terms while all other continuous covariates are in ratios/fractions (not percent). The standard errors (in parentheses) are robust to heteroscedasticity, while the notations ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Regression Analysis	(10) 1st Year Risky	(11) Less-Risky	(12) Diff (10vs11)	(13) 2nd Year Risky	(14) Less-Risky	(15) Diff (13vs14)	(16) Over 2 Years Risky	(17) Less-Risky	(18) Diff (16vs17)
Pre-Risk	0.412	0.470**	-0.058	0.820	1.100***	-0.280	0.994**	0.462***	0.532
	(0.640)	(0.198)		(0.630)	(0.399)		(0.497)	(0.170)	
Bank-Size	-0.004	-0.001	-0.003	-0.005*	0.004**	-0.009***	-0.001	0.000	-0.001
	(0.003)	(0.001)		(0.003)	(0.002)		(0.002)	(0.001)	
ROA	-1.144	0.010	-1.154	0.202	1.391	-1.189	-0.517	-0.621	0.104
	(0.983)	(0.867)		(0.767)	(2.321)		(0.846)	(0.587)	
Loans-Assets	-0.095**	0.008	-0.103***	-0.065	-0.028	-0.037	-0.015	0.002	-0.017
	(0.038)	(0.013)		(0.041)	(0.048)		(0.025)	(0.007)	
Buffer	-0.499**	0.089	-0.588**	-0.616**	0.095	-0.711***	-0.216	0.040	-0.256
	(0.234)	(0.068)		(0.249)	(0.148)		(0.177)	(0.051)	
Tobin's Q	0.009**	-0.001	0.010**	0.005	-0.009	0.014**	0.002	0.002	0.000
	(0.004)	(0.003)		(0.004)	(0.007)		(0.003)	(0.002)	
Equity Ratio	0.270*	-0.301**	0.571***	0.241*	0.014	0.227	0.059	0.049	0.010
	(0.156)	(0.143)		(0.139)	(0.460)		(0.115)	(0.083)	
Credit Quality	-0.019	0.002	-0.021	-0.032	-0.003	-0.029	-0.023*	-0.008**	-0.015
	(0.017)	(0.003)		(0.023)	(0.005)		(0.014)	(0.004)	
Recession	-0.013*	-0.010***	-0.003	-0.000	-0.016**	0.016*	-0.007	-0.004*	-0.003
	(0.007)	(0.003)		(0.006)	(0.007)		(0.005)	(0.002)	
MES	-0.042	0.201*	-0.243	-0.040	-0.058	0.018	-0.213	0.002	-0.215
	(0.167)	(0.118)		(0.245)	(0.216)		(0.158)	(0.069)	
Constant	0.105**	0.024*	0.081*	0.119**	-0.010	0.129**	0.051	0.001	0.050
	(0.043)	(0.013)		(0.048)	(0.026)		(0.035)	(0.010)	
Observations	89	88		70	79		89	88	
R-squared	0.231	0.250		0.312	0.129		0.290	0.176	

Chapter 5: Summary and Implications

5.1 Background of the Thesis

The extent of economic disruptions brought by the instability of the banking sector necessitate proactive regulatory mechanisms that seek to prevent a repeated occurrence of distress episodes. Regulatory capital frameworks are one of the key preventive measures available in this regard. However, these frameworks that have overtime been used as a yardstick for banking safety and soundness proved inadequate to contain the might of the global financial crisis.

On these grounds, the regulators embarked on the enormous task of overhauling the capital frameworks to improve the quality and quantity of elements that would safeguard bank soundness. As a result, a greater emphasis is placed on high quality capital elements as true loss-absorbing securities, thereby relegating the importance of sub-debt in regulatory capital. Notwithstanding that, the quantity of sub-debt in regulatory capital remains nontrivial, yet there is little evidence as to whether banks use the instrument to primarily improve their overall capital adequacy levels. Moreover, we know little about perceptions of shareholders with regard to the use of sub-debt for these regulatory purposes.

In some ways, the continuous inclusion of sub-debt within regulatory capital should be effective in influencing banks to recapitalize. Crucially, these efforts should not camouflage vices that threaten the objectives of financial stability. More importantly, these goals should be equally embraced by other bank stakeholders such that there is no interference to the regulatory effectiveness of capital elements, specifically sub-debt.

This thesis brings perspective to these issues by analysing the use of sub-debt across a longer period that cuts across all regulatory capital regimes in the US. Through this analysis, the thesis contributes to the wider debate on the effectiveness of regulation on the capital structure decisions of banks. It also informs ongoing debates on the relevance of sub-debt as an element of regulatory capital.

The task of isolating the regulatory relevance of sub-debt begins with chapter 2 reviewing other roles of the instrument in the wider capital structure of banks. Apart from its intended regulatory function, sub-debt is prominent for its disciplinary, informational and tax purposes. Given the residual nature of their claims, sub-debt holders are sensitive to bank risk hence considered to be effective players in curbing the risk-taking actions of banks. Banks also use sub-debt as a conduit for transmitting positive information to the market, while the tax-deductibility of the interest on the instrument earns them a tax benefit. Effectively, these auxiliary roles alongside the application of the instrument by non-financial firms that are not subject to capital requirements makes the regulatory role of sub-debt less obvious. The two empirical chapters of this thesis hence attempt to clear this ambiguity.

Specifically, chapter 3 examines the role of regulation on the issuance of sub-debt. The chapter applies the regulatory capital buffer as an indicator of the regulatory binding constraint and contrasts these effects with the variables that explain the debt priority structure in general. The chapter proceeds to evaluate if the regulatory privilege of issuing sub-debt conceals any undesirable intentions contradictory to financial stability.

Chapter 4 further expands the regulatory scope of sub-debt by considering the value perceptions of shareholders with respect to its issuance. The primary purpose of the chapter is to test for shareholder incentives within the wider capital structure, which could weaken

the effective application of sub-debt as a regulatory capital element that banks, particularly vulnerable ones, can access to improve their capital position. These incentives are traceable to the seniority of debt within the broader bank capital structure that presents opportunities for risk-shifting and redistribution of wealth from subordinated claims. The value of these opportunities to shareholders is reviewed by testing the stock reactions to the announcement of senior debt, a non-regulatory element, and sub-debt. Furthermore, the chapter establishes whether the security choice decisions of banks are deliberately made to support the risk-shifting motives of shareholders by examining the post-issuance risk profile of banks. More specifically, the study evaluates whether the choice of senior debt exacerbates the risk-taking behavior of banks, particularly those that have a legacy of being risky.

5.2 Summary of Findings

The empirical chapters revealed some important findings on the effectiveness of regulation behind the use of sub-debt in banking and some disturbances to the regulatory effectiveness of the instrument.

5.2.1 Does Regulation Drive Banks to Issue Subordinated Debt?

Chapter 3 offers insights on the primary drivers of sub-debt issuance over the regulatory capital regimes covering the period from 1983 to 2015. The main finding of the study is that the issuance of sub-debt seems to be driven by regulatory motives that allow the instrument to serve as capital. In this manner, banks that are most in need of capital, thus are less-capitalized, see an opportunity to improve their regulatory capital through sub-debt. These findings account for the fact that banks can also issue equity to affect their underlying capital adequacy ratios.

Arguably, the list of capital elements in this regard is not exhaustive given that banks can also access TPS and perpetual preferred stock to restore their capital position. Nevertheless, our analysis considers sub-debt and equity as key regulatory components that have stood the test of capital frameworks, and their coexistence within capital even predates the era of formal capital requirements (Ehlen, 1983). These securities, therefore, offer a rich dataset to reflect upon the effectiveness of regulation across capital requirements that differently treated their participation in regulatory capital. However, instruments like TPS were available for a limited timeframe within regulatory capital, hence would narrow the scope of discussions on the relevance of capital requirements on security issuance. Similarly, perpetual preferred shares would also inadequately capture the regulatory effect due to their scarcity in regulatory capital (see, Boyson et al., 2016).

Essentially, the issuance of equity or sub-debt represent a common action towards improving capital adequacy ratios over the long-term. In this instance, the securities could be seen as substitutes in the drive to meet regulatory capital requirements, hence their issuance could be distinct and unrelated choices even when excluding alternative securities for reasons advanced above. In fact, the study further establishes that the regulatory motive of sub-debt is not affected by the ability of banks to build their capital base through internal means viz., by cutting dividends or reducing assets. On these grounds, we found it reasonable to rely on the assumption of Independence of Irrelevant Alternatives (IIA) for the analysis in this chapter.

Notwithstanding that, the present results have been exposed to extensive tests to eliminate alternative explanations and the chapter continues to show that the decision to allow banks to use sub-debt for regulatory purposes does not present opportunities for risk shifting. Rather, banks that are prone to risk-shifting have a lower chance of issuing sub-

debt. These findings suggest market discipline in debt quantities is effective in rationing funding to risky banks. The results also reveal that large banks also face these disciplinary measures - against the view that these banks are spared from discipline due to government guarantees associated with them.

5.2.2 The Effect of Debt Priority on the Regulatory Role of Subordinated Debt

Chapter 4 explains the tensions within the priority structure of bank capital that dilute the effective use of sub-debt for regulatory purposes. The chapter is based on arguments that disregard the regulatory role of sub-debt without paying much attention to factors that obscure its participation in this respect, particularly the seniority of securities within the wider bank capital structure. The main finding of the chapter is that shareholders seem to place greater value on the risk-shifting and wealth-expropriation opportunities associated with senior debt, which weakens their perceptions about the regulatory value of sub-debt. Specifically, shareholders of banks that would most likely benefit from the issuance of sub-debt do not value the issuance of this capital improving element. To the contrary, the chapter shows that these banks, which are usually risky or less capitalized, create significant shareholder value when they issue senior debt.

In further tests, the chapter finds that the use of senior debt by risky or less-capitalized banks generate significant wealth for shareholders, as such, the opportunities to shift risk and redistribute wealth from other stakeholders seem to be mainly valuable for vulnerable banks. Pursuant to these risk-shifting opportunities, the use of senior debt aggravates the risk-taking behavior of banks in the long-run. In this case, banks that have a legacy of being risky or less capitalized become riskier after issuing senior debt. These effects do not show up following the issuance of sub-debt.

A key challenge to the analysis in this chapter was the screening of senior debt securities. Unlike sub-debt that can be designed along regulatory requirements, senior debt is varied and banks can apply it in many forms. The task of choosing uniform bank senior debt issues is, therefore, a rarity and the existing limited studies offer little guidance in this regard. For example, Hancock and Birchler (2004) does not explicitly state their criteria for sampling senior debt, while Schandlbauer (2014), for unexplained reasons, drops short-term debt securities. Therefore, deciding on the kind of senior debt for the purpose of this chapter was an intuitive decision. The chapter proceeded by keeping straight senior debt securities i.e. non-hybrid issues, excluding complex deals such as swaps, mortgage bonds, and dropping deposit-like or loan-like securities.

Nevertheless, the dataset for senior debt issues remains large, hence further possible filters are unlikely to significantly alter the sample size for this analysis, thereby providing reasonable comfort to the findings of this chapter. On that basis, the chapter concludes that the moral hazard opportunities that come along with the seniority of debt within the broader capital structure of a bank interferes with the regulatory function of sub-debt. Therefore, the observed inefficacy of sub-debt in regulatory capital is not necessarily due to its design, but owes to the conflicting shareholder incentives within the priority structure of the wider bank capital.

5.3 Policy Implications and Future Areas for Research

The findings of this thesis have important implications on the use of sub-debt by banks. However, the regulatory importance of sub-debt itself is threatened by numerous regulatory surcharges and buffers that require equity capital. For example, the countercyclical and conservation buffers would at least increase the minimum capital adequacy requirement to

13%. Under this scenario, sub-debt and other Tier 2 elements would contribute about 15% to the total capital. At these levels, it is then for future debate to establish whether the instrument has any tangible economic purpose, despite the evidence that regulation drives its issuance.

In addition, the Total Loss Absorbing Capital requirements (TLAC) would require large banks to issue unsecured/unguaranteed debt with a minimum maturity of at least 12 months (Federal Reserve System, 2017). However, the credit enhancement and payment acceleration clauses on this debt makes it ineligible for regulatory capital, yet it shares some common attributes with sub-debt. With these inconsistencies, coupled with the diminishing proportion of sub-debt in regulatory capital, it seems inconceivable to expect large banks to still favor sub-debt. This is a concern given that sub-debt is historically utilized by these banks. These issues, therefore, need to be further discussed with a view to informing the future of sub-debt in regulatory capital. In general, future research needs to provide more evidence on the regulatory importance of sub-debt, otherwise the overemphasis on market discipline could ultimately compromise its attributes of capital.

Lastly, the tendency of shareholders to systematically value the risk-shifting and wealth-expropriation opportunities presented by senior debt over the regulatory benefits of sub-debt suggest that regulators should engage bank shareholders in the regulation process. Moreover, the prevalence of this opportunistic behavior implores future research to directly test if shareholders "ultimately realize" their motives to expropriate the wealth and shift risk to subordinated debtholders. That is, subsequent studies could explore how sub-debt yields or returns react to the issuance of senior debt.

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