

# BANK CEOs, INSIDE DEBT COMPENSATION, AND THE GLOBAL FINANCIAL CRISIS

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## ABSTRACT

Bank executives' compensation has been widely identified as a culprit in the Global Financial Crisis, and reform of banker pay is high on the public policy agenda. While Congress targeted its reforms primarily at bankers' equity-based pay incentives, empirical research fails to show any correlation between bank CEO equity incentives and bank performance in the Financial Crisis. We offer an alternative analysis, hypothesizing that bank CEOs' inside debt incentives correlate with reduced bank risk taking and improved bank performance in the Crisis. A nascent literature shows that inside debt may dampen CEOs' risk taking incentives. Unlike the industrial firms that have been the main focus of this literature, however, banks are subject to pervasive regulatory oversight to constrain risk taking. Therefore, the transmission of risk taking incentives through executive pay structure may not be straightforward and cannot be taken for granted. Nevertheless, we find evidence consistent with our hypotheses. Our empirical evidence provides a rationale for the use of inside debt compensation in structuring executive compensation in the banking context.

*Keywords:* banks, financial crisis, banking regulation, CEO compensation, inside debt, corporate governance, agency costs of debt.

*JEL Classification:* G01, G21, G32

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## 1. Introduction

Executive compensation ranks among the commonly identified causes of the Global Financial Crisis. Policy makers, pundits, and academics have decried the excesses of executive compensation at commercial banks and other financial institutions, both in terms of absolute amounts and perverse incentive structures that led to excessive risk taking. Reform of banker pay is high on the public policy agenda, and a number of thoughtful reform proposals have emerged (Bebchuk and Spamann, 2010; Bhagat and Romano, 2009; Bolton, Mehran and Shapiro, 2010; Edmans, et al., 2011; Tung, 2011).

In this paper, we offer important empirical evidence to move this debate forward. We provide new evidence on the effects of commercial bank CEOs' inside debt incentives on bank risk taking during the Global Financial Crisis. To our knowledge, ours is the first such empirical inquiry. While conventional wisdom holds that executive compensation takes only two basic forms—cash and equity, a nascent literature shows that firm managers hold significant amounts of inside debt—debt claims against their own firms—in the form of pensions and deferred compensation. Because these claims on the firm are typically unfunded and unsecured, CEOs holding these claims face default risk just as outside creditors do. Theory predicts and existing empirical evidence supports the claim that as the proportion of CEO wealth held in the form of inside debt increases relative to CEO equity holdings, risk taking declines (Edmans and Liu, 2011; Sundaram and Yermack, 2007; Wei and Yermack, 2011; Bolton, Mehran, and Shapiro, 2010).

To date, the empirical work on inside debt incentives has focused primarily on industrial firms. For commercial banks, however, the transmission of risk taking incentives through

executive compensation structure cannot be taken for granted.<sup>1</sup> Unlike industrial firms and even other financial institutions, commercial banks enjoy deposit insurance—an explicit government guarantee that covers substantial portions of their liabilities. The resulting moral hazard requires that banks be subject to a comprehensive framework of prudential regulation, whose principal goal is to constrain bank risk taking. “[R]egulators define the general constraints and regulations on bank risk taking behavior.” (Saunders, Strock, and Travlos 1990). The pervasiveness of this supervision leads some to view banking regulation as a substitute for corporate governance (Adams and Mehran, 2003).

The influence of banking regulation on bank risk taking and bankers’ compensation arrangements makes it difficult to predict ex ante whether inside debt incentives mattered in the Financial Crisis, despite the demonstrated effects of inside debt for non-financial firms. Although the fact of the Crisis itself suggests the overall inefficacy of banking regulation for controlling systemic risk before the Crisis, it is unclear whether this overall inefficacy translates into consistent effects across banks that might generally either blunt or amplify inside debt incentives in the Crisis.

Whether inside debt incentives mattered in the Crisis, however, has important policy implications. High leverage makes banks more volatile than industrial firms, and because of systemic risk considerations, individual bank risk taking implicates social welfare concerns that do not arise with industrial firms. In a prominent recent paper, Fahlenbrach and Stulz (2011) show that no association exists between the structure of bank CEOs’ equity incentives preceding the Crisis and the performance of their banks during the Crisis. Better CEO alignment with

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<sup>1</sup> Moreover, an extensive finance literature investigates the associations among commercial banking regulation, banker compensation structure, and bank risk taking (Anderson and Fraser, 2000; Brewer, Hunter and Jackson, 2003; Crawford, Ezell and Miles, 1995; Cuñat and Guadalupe, 2009; Houston and James, 1995; Hubbard and Palia, 1995; John, Saunders and Senbet, 2000; Saunders, Strock and Travlos, 1990).

shareholder interests did not result in better bank performance during the Crisis. Instead, banks with greater shareholder-CEO alignment may have performed worse. This important finding runs counter to the rationale for Say-on-Pay, the centerpiece of executive compensation reform in the recently enacted Dodd-Frank Wall Street Reform and Consumer Protection Act. By requiring a shareholder vote on executive compensation arrangements, Say-on-Pay is likely to increase bank shareholder-CEO alignments,<sup>3</sup> hardly a promising solution after Fahlenbrach and Stulz (2011). If stronger CEO equity incentives did not improve bank performance in the Crisis, then what might? We advance the inquiry with the first empirical study of inside debt effects on bank risk taking in the Financial Crisis. We explicitly account for the presence of banks' special liabilities—government-insured deposit liabilities—in our empirical tests.

Using 2006 compensation data for a sample of 83 bank CEOs from the ExecuComp database, we investigate whether the presence of inside debt in bank CEOs' portfolios in 2006 may have been an important factor in reducing bank risk taking and improving performance during the Crisis. We use two alternative proxies for CEOs' inside debt incentives: CEO personal inside debt-equity ratio and bank CEO relative incentive ratio, which is the CEO's personal inside debt-equity ratio over the bank's debt-equity ratio, adjusted to account for (a) the differing convexity and duration of options versus stock (Wei and Yermack, 2011); and (b) the moral hazard induced by deposit insurance. This latter adjustment we effect by overweighting deposit liabilities when computing banks' debt-equity ratio, which captures the greater risk shifting incentives from insured deposits as compared to garden variety liabilities.

We find that bank CEOs' inside debt holdings preceding the Crisis are significantly positively associated with better stock returns and accounting return on assets, as measured from

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<sup>3</sup> Though enacted as part of a watershed reform of financial regulation, Say-on-Pay is not limited to banks, but applies to all public companies.

July 2007 through the end of 2008. We also show a significant negative association between our measures of CEOs' inside debt incentives and a number of measures of bank risk taking during the Crisis. We offer two complementary explanations for these results. While higher risk conventionally correlates with higher returns, in a crisis, low-risk banks should perform better because the left tails of the probability distributions of their returns are less extreme than for high-risk banks. At the same time, inside debt can induce managerial effort in a crisis, since inside debt gives managers a stake in the firm's liquidation value. This effect will be especially pronounced in firms where insolvency is likely or effort is likely to enhance liquidation value (Edmans and Liu, 2011). This higher effort can benefit both shareholders and debt holders.

The risk taking effects of inside debt continue in the period immediately following the Crisis. Our post-Crisis tests for performance show no statistical significance, however, which is consistent with the idea that outside of the Crisis context, low-risk strategies would generally not result in superior equity performance.

Our empirical evidence provides a rationale for the use of inside debt compensation in structuring executive compensation in the banking context. Our paper makes the following contributions. First, our paper has important policy implications for banking regulation, suggesting that inside debt compensation for bank executives may offer an effective tool for risk regulation. Not only may banking regulation offer a substitute for corporate governance, as some believe; we offer the first evidence that governance—in the form of bank CEO compensation structure—may substitute for banking regulation, as a number of commentators have recently proposed (Bebchuk and Spamann, 2010; Bhagat and Romano, 2009; Bolton, Mehran, and Shapiro, 2010; Tung, 2011). Second, we expand the scope of the emerging literature on inside debt as an important component of the optimal incentive contract. We

demonstrate that inside debt incentives may have effects even in the highly regulated environment of commercial banking. Finally, we suggest an answer to the question left open by Fahlenbrach and Stulz (2011) by offering a new lens through which to examine the relation between banker pay structure and the Global Financial Crisis. The rest of the paper is organized as follows: In Section 2, we develop hypotheses regarding the relation between bank CEOs' inside debt holdings and banks' financial performance and risk taking during the Crisis. We describe the sample and the research methodology in Section 3, and present empirical results in Section 4. Section 5 concludes the paper.

## **2. Related Research and Hypothesis Development**

### **2.1 Banker Pay and the Global Financial Crisis**

A number of researchers have attempted to demonstrate links between the structure of executives' equity-based pay and the performance of banks during the Global Financial Crisis. Most prominently, Fahlenbrach and Stulz (2011) investigate whether the degree of CEO-shareholder alignment before the Crisis can explain bank performance during the Crisis. Their sample includes investment banks as well as commercial banks. Testing the relation between CEO equity holdings at the end of 2006 and stock performance and accounting returns from July 2007 through the end of 2008, they find no evidence that banks with better CEO-shareholder alignment had better returns during the Crisis, and some evidence that better alignment was associated with significantly worse performance. In addition, addressing the argument that excessive option compensation encouraged excessive risk taking, they find no evidence that

greater sensitivity of CEO pay to stock volatility resulted in worse stock returns during the Crisis.<sup>4</sup>

DeYoung et al. (2010) study the relation between the pay-risk (vega) and pay-performance (delta) sensitivities of CEO wealth and business policy decisions at the largest commercial banks between 1994 and 2006.<sup>5</sup> They find that high-vega banks garner a larger share of their income from nontraditional banking activities than low-vega banks. These banks also invest a larger share of their assets in private mortgage backed securities (private MBS)—securities backed by subprime or otherwise non-conforming mortgages—and a smaller share in on-balance sheet portfolios of real estate loans.

## 2.2 Inside Debt

A nascent literature, unrelated to banks or the Global Financial Crisis, argues that the existing executive compensation literature has overlooked an important species of executive pay incentive: inside debt—firm debt held by insiders of the firm. Conventional wisdom holds that executive pay comes in only two basic forms: cash and equity-based compensation. Managers do not hold inside debt. Recent research shows, however, that managers in fact do hold significant amounts of inside debt in the form of pensions and deferred compensation.<sup>6</sup> These

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<sup>4</sup> From these findings, along with their finding that CEOs did not reduce or hedge their equity holdings during the Crisis, they suggest that CEOs acted with shareholder interests in mind before the Crisis, and that the poor ex post results—costly to both the CEOs and their banks—were not expected by CEOs.

<sup>5</sup> Vega is measured as the dollar change in CEO wealth for a 0.01 change in the annualized standard deviation of stock returns. Delta is measured as the dollar change in CEO wealth for every 1% change in stock price.

<sup>6</sup> By the time Jack Welch retired as the CEO of General Electric in 2001, for example, the present value of his pension benefits plus deferred compensation is estimated to have exceeded \$109 million. In one sample of Fortune 500 CEOs, the pension component of total compensation for CEOs age sixty-one to sixty-five was 40% larger on average than their base salary, and equaled 23% of equity compensation (Sundaram and Yermack, 2007). Also as of the end of 2006, at least seven public company CEOs held inside debt balances in excess of \$100 million (Wei and Yermack, 2011).

forms of compensation give managers fixed claims against the firm that like conventional debt, depend on the firm's solvency for full payment.<sup>7</sup>

Theory and empirical evidence support the idea that holding fixed claims against the firm may dampen CEOs' risk taking incentives. Edmans and Liu (2011) model inside debt as part of an optimal compensation arrangement. While equity compensation incentivizes managers to exert more effort when the firm is solvent—thereby addressing the agency costs of equity—inside debt reduces the agency costs of debt by giving managers a stake in the firm's liquidation value.<sup>8</sup> This counters the risk shifting incentives that accompany equity compensation. It also improves managerial effort as the firm nears insolvency. The appropriate amount of debt depends on the relative magnitudes of the two different types of agency problems—shirking versus risk shifting. Especially for firms with high leverage (like banks), a high probability of default, and other severe risk-shifting incentives, debt may be an important component of optimal executive compensation.<sup>9</sup>

Empirical evidence also supports the idea that inside debt may dampen managers' risk taking incentives. Sundaram and Yermack (2007) find that as the value of a CEO's pension increases relative to the value of her equity holdings, risk taking declines. They use “distance-to-default” as their measure of firm risk—basically the number of standard deviation decreases in

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<sup>7</sup> Executive pensions and deferred compensation are typically nonqualified deferred compensation arrangements under the tax laws. These arrangements are almost always unfunded and unsecured (or if funded, the funds remain subject to creditors' claims). This treatment is required in order for the executive to be able to defer income tax on the compensation until she receives it in retirement. I.R.C. § 409A. Executives may sometimes also enjoy benefits under their firms' tax qualified pension plans, but (a) these are rarely structured as fully funded defined benefit plans; and (b) in any event, the value of these benefits is dwarfed by the amount of benefits due the executive under nonqualified arrangements (Wei and Yermack, 2011). Finally, to the extent that we may slightly overstate the value of CEOs' inside debt holdings, this merely biases our results against us.

<sup>8</sup> While Jensen and Meckling (1976) consider the agency costs of equity and debt separately, Edmans and Liu (2011) consider them simultaneously, thereby enabling an analysis of the tradeoffs between incentivizing managerial effort and influencing investment choice.

<sup>9</sup> The appropriate amount of inside debt increases with leverage, the probability of default, and the manager's ability to affect liquidation values, while debt should be reduced with increasing growth opportunities (Edmans and Liu, 2011).

firm value that would be required to put the firm in default. They show that when a CEO's debt-equity ratio exceeds her firm's debt-equity ratio, distance-to-default declines by 0.3 to 0.4 standard deviations.

Wei and Yermack (2011) find evidence that investors *expect* firm managers to manage more conservatively as their inside debt holdings increase. They examine the reaction of public debt and equity markets to the initial run of newly SEC-mandated inside debt disclosures in 2007.<sup>10</sup> They document that when the CEO's inside debt-equity ratio exceeds her firm's, the disclosure triggers a wealth transfer from equity holders to debt holders. Bond prices rise, while equity prices fall. In addition, price volatility drops for both debt and equity. These market reactions are consistent with the idea that investors expect managers to run their firms more conservatively—taking less risk—when they hold large inside debt positions.<sup>11</sup>

### 2.3 Inside Debt as a Substitute for Bank Regulation

Banks are special institutions, within which the agency costs of debt are severe. In addition to banks' high leverage and their CEOs' significant equity incentives—which by themselves may magnify managers' risk taking tendencies and debt-equity conflicts—banks do not suffer the same intensity of creditor monitoring that other borrower firms do. Unlike other types of firms, an important class of bank creditors—insured depositors—do not monitor because their claims are insured by the government. Insured deposits generally offer a stable source of bank financing (Billet, Garfinkel and O'Neal, 1998), and this held true during the

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<sup>10</sup> In 2007, the Securities and Exchange Commission began requiring more extensive executive compensation disclosures, including explicit valuations of officers' pension benefits and deferred compensation. Prior to the regulation's implementation, precise valuation of these items was quite complicated and required significant information outside of the firm's public filings.

<sup>11</sup> Another emerging empirical literature finds evidence that inside debt holdings affect firms' debt financing contracts along a number of fronts—pricing, covenant structure, and syndicate size (Wang, Xie, and Xin, 2010; Anantharaman, Fang, and Gong, 2010).

Crisis (Cornett, McNutt, Strahan and Tehranian, 2011; Ivashina and Scharfstein, 2010). Deposit insurance therefore generates important moral hazard for bankers, and the government is effectively an important creditor of insured banks. Banking supervision leaves to government regulators the task of constraining bank risk taking. It was understood even before the Financial Crisis that banking regulation should respond to the risk taking incentives built into bankers' compensation arrangements (Adams and Mehran, 2003; John, Saunders and Senbet, 2000).

A long literature highlights the interplay of bank CEO pay incentives with banking regulation.<sup>12</sup> First off, CEO pay structure in commercial banking is different from other industries. Bank CEOs' equity-based pay comprises a smaller share of total pay than in other industries (Adams and Mehran, 2003; Houston and James, 1995), and our sample also shows that bank CEOs' inside debt ratios are appreciably smaller than for industrial companies. Second, the structure of bank CEO pay also responds to regulatory change. Equity pay-performance sensitivity increases with deregulation, suggesting that shareholders hope to incentivize CEOs to respond to the greater competition that comes with deregulation and to pursue the resulting growth opportunities (Crawford, Ezell and Miles, 1995; Cuñat and Guadalupe, 2009; Hubbard and Palia, 1995). Several studies also show that the effect of equity incentives on bank risk taking varies with the relative severity or laxity of regulation (Saunders, Strock and Travlos, 1990; Anderson and Fraser, 2000). Thus, the nature of the regulatory environment may magnify or mitigate existing bank risk taking incentives. Finally, regulation might also respond to bank CEO pay incentives. John, Saunders and Senbet (2000) offer a model showing that setting deposit insurance premiums to accounts for bankers' pay incentives can induce bank owners to offer optimal compensation structures that lead to efficient bank investment policies.

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<sup>12</sup> Like the executive compensation literature generally, banker pay scholarship has focused almost exclusively on equity incentives.

In the aftermath of the Crisis, a number of commentators proposed to reform the structure of bankers' incentive compensation in order to deter the excessive risk taking that regulation had failed to prevent (Bebchuk and Spamann, 2010; Bhagat and Romano, 2009; Bolton, Mehran and Shapiro, 2010; Tung, 2011). Bolton, Mehran and Shapiro (2010) model financial firm CEOs' risk-taking incentives, showing that tying CEO compensation to a measure of the firm's default risk—CDS spreads, in their case—could reduce firm risk taking.<sup>13</sup> Tung (2011) argues that bank CEO incentive pay should include banks' subordinated debt securities. Because the market prices of such securities are sensitive to bank risk taking, their inclusion in bank CEOs' personal portfolios would give CEOs personal incentives to avoid excessive risk taking. Bebchuk and Spamann (2010) propose to pay bank executives with a proportional slice of their bank holding company's securities—preferred stock and bonds, as well as common equity. This set of securities would expose bankers to a broader range of downside risks to which the bank's investors are subject, and thereby deter excessive risk taking.

## 2.4 Our Hypotheses

Our investigation offers important extensions of the three literatures described above by examining the effects of inside debt incentives of bank CEOs on risk taking in the Financial Crisis. Though we recognize the possibility that government regulation of bank risk taking may swamp the effects of inside debt that have been identified in other contexts, we tentatively predict that inside debt incentives for bank CEOs in the Financial Crisis will be negatively correlated with risk taking, similar to the effects shown for industrial firms. We predict as well that inside debt incentives should be associated with better bank performance in the Crisis.

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<sup>13</sup> Following Wei and Yermack (2011), they offer an event study using CDS spreads to show that market participants believe that financial firms' risk taking decreases with CEO inside debt holdings.

While higher risk conventionally correlates with higher expected returns, low-risk banks should show better actual returns in a crisis because the left tails of the probability distributions of their returns are less extreme than for high-risk banks. The right tails matter less in a crisis, so on average, low-risk banks should perform better, in the same way that low-beta stocks perform better than high-beta stocks in a market downturn, even though expected returns of the low-beta stocks would have been lower ex ante (Brealey, Myers and Allen, 2010). Stronger inside debt incentives may also improve stock and accounting returns by inducing stronger CEO effort in the Crisis, since CEOs would have a stake in the liquidation values of their banks (Edmans and Liu, 2011). This higher effort may benefit equity holders as well as debt holders. We therefore expect that bank CEO inside debt incentives should positively correlate with bank returns during the Crisis.

Assuming that the presence of banking regulation does not swamp inside debt incentives for our commercial banks, then bank CEOs face risks and incentives similar to those of industrial firms. Virtually all large commercial banks are owned by bank holding companies (BHCs), and BHC CEOs are the focus of our inquiry.<sup>14</sup> For both types of firms, excessive risk taking puts managers' inside debt at risk, with none of the unlimited upside potential of equity. Excessive risk taking may cause a significant loss of value in managers' inside debt portfolios when their firms become distressed, since these claims will enjoy only low priority in payment. In bankruptcy, for example, BHC managers' inside debt claims are treated no differently from those of industrial firms' managers: Inside debt claims are general unsecured claims.<sup>15</sup> These claims are paid only after secured claims and a number of statutorily favored claims are paid in full, and

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<sup>14</sup> The BHC is the publicly traded entity that is subject to the SEC's mandatory disclosure rules. All our bank data are therefore gathered at the BHC level.

<sup>15</sup> A limited priority exists for employee wage claims, but the limits are sufficiently low as to make this priority trivial for bank executives. See 11 U.S.C. § 507(a)(4), (5).

managers' inside debt claims would be paid pro rata with all other general unsecured claims. As with industrial firms, then, BHC CEOs' inside debt claims are placed at risk when the BHC or its subsidiary banks take on risky projects.<sup>16</sup>

We turn now to our empirical analyses.

### **3 Sample and Research Methodology**

#### **3.1 Data and Sample**

The data come from several sources. We obtain compensation data for bank CEOs from the Compustat ExecuComp database. Table 1 describes the sample selection process. We start with a sample of 113 CEOs of commercial banks and thrifts in 2006 (SIC codes 6020, 6035, 6036, 6162, and 6199).<sup>17</sup> Similar to Fahlenbrach and Stulz (2011), we remove American Express from the sample because it is not a traditional bank. We also remove two banks whose fiscal years end before December because we require 2006 year-end data on CEO inside debt compensation. Finally, we remove 16 banks from the sample that experienced CEO turnover during 2006-early 2007 and 11 that were acquired during 2006-2007. This filter procedure is necessary because we examine the effects of CEOs' inside debt holdings in 2006 on their actions during the Global Financial Crisis, as measured by their banks' financial performance and risk exposure. The final sample contains 83 CEO observations.<sup>18</sup>

We collect CEO age and employment history data from annual reports and proxy statements. Financial accounting and stock returns data come from Compustat and CRSP,

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<sup>16</sup> A BHC's financial distress typically goes hand in hand with the distress of its subsidiary banks, which are not eligible for bankruptcy. See 11 U.S.C. § 109(b)(2). Instead, a distressed bank is typically dealt with by an FDIC receivership action, in which the FDIC seizes the failed bank's assets for liquidation. When the banking subsidiary fails, the BHC often goes into bankruptcy.

<sup>17</sup> We focus exclusively on commercial banks and thrifts because of the highly structured regulatory framework in which they operate. They are highly regulated even relative to other financial firms.

<sup>18</sup> See Appendix 2 and Appendix 3 for the list of banks included and excluded from the sample.

respectively. Bank deposit data come from the FDIC Statistics on Deposit Institutions. We collect bond pricing data from Bloomberg in order to calculate bond returns as a measure of risk. We extract bank activity data from the Federal Reserve Y-9C database in order to examine the riskiness of bank loans and banks' exposure to mortgage backed securities investments. This merge further reduces the sample to 64 observations.

## **3.2 Variable Measurement**

### **3.2.1 Inside Debt**

Following existing studies, we treat defined benefit pensions and deferred compensation as executives' inside debt compensation. Recent SEC reforms increase the transparency of disclosure for both forms of compensation, which allows us to measure the level of CEOs' inside debt on a consistent basis. Specifically, bank CEOs' inside debt is defined as the present value of the CEO's pension and deferred compensation balances (the sum of DEFER\_BALANCE\_TOT and PENSION\_VALUE\_TOT from ExecuComp).<sup>19</sup>

For the value of the CEO's equity portfolio, we compute the sum of the values of direct stock holdings, stock option holdings, and unvested restricted stock holdings. We value stock holdings by multiplying shares held by the closing stock price of 2006. We value option holdings with the Black-Scholes option pricing model, relying on the new proxy disclosure on outstanding equity awards, which supplies detailed information on exercise prices and expiration dates of each outstanding option grant. We use the closing stock price of 2006 as the current stock price, the 36-month lagged volatility at the end of 2006 as the estimate of volatility, and the bank's cash dividend in 2006 divided by the closing stock price of 2006 as the estimate of

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<sup>19</sup> Some pension and deferred compensation arrangements offer equity-like pay-for-performance features, so they are not simply fixed claims against the firm. We account for these performance features in several ways, as described in Appendix 6. It turns out that these performance features have no significant effect on the quality of our results, so for brevity, we do not report results of the tests that account for these performance features.

dividend yield.<sup>20</sup> Additionally we use treasury rates of different maturities (matched to the expiration date of each option grant) as estimates of the risk-free interest rate. Finally, we take the value of unvested restricted stock holdings from ExecuComp (STOCK\_UNVEST\_VAL).

Following Sundaram and Yermack (2007) and Wei and Yermack (2011), we construct two proxies for bank CEOs' inside debt incentives. The first proxy, the CEO's personal debt-equity ratio, is the value of the CEO's personal inside debt holdings divided by the value of the CEO's equity portfolio holdings. The second proxy is the bank CEO's relative incentive ratio, which is modeled on the relative incentive ratio of Wei and Yermack (2011). Their measure captures the marginal change in the value of the CEO's inside debt over the marginal change in her inside equity holdings, scaled by the ratio of the marginal change in the firm's external debt over the marginal change in its outside equity, given a unit change in the overall value of the firm (see Wei and Yermack (2011) for details of variable construction). The relative incentive ratio essentially reflects the CEO's personal inside debt-equity ratio divided by the firm's debt-equity ratio, adjusted to account for the differing convexity and duration of options versus stock. We adapt this measure to the banking context by overweighting insured deposit liabilities in our calculation of firm debt in order to capture their special risk-shifting incentives. Our main tests overweight by a factor of two; a factor of three generates similar results. We include the bank's total liabilities in our measure of firm debt because all the bank's liabilities affect bank CEOs' risk-shifting incentives (Bolton, Mehran, and Shapiro, 2010).

### 3.2.2 Other Proxies

**Proxies for Banks' Performance.** We employ both stock return performance and accounting performance from the middle of 2007 to the end of 2008 as proxies for banks'

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<sup>20</sup> As a robustness check, we use the 60-month lagged volatility at the end of 2006 as the estimate of volatility to calculate the value of stock options, and we obtain qualitatively similar results as those reported in the paper.

performance during the Global Financial Crisis.<sup>21</sup> For stock return performance, we estimate buy-and-hold returns between July 2007 and December 2008 (*Ret\_jul07\_dec08*, similar to Fahlenbrach and Stulz, 2011). For accounting performance, we use return on assets and return on equity from the third quarter of 2007 to the fourth quarter of 2008 (*ROA\_q307\_q408* and *ROE\_q307\_q408*).

**Proxies for Banks' Risk Taking.** We follow prior literature to construct six proxies for banks' risk taking during the Global Financial Crisis (Chen, Steiner, and Whyte, 2006; Coles, Daniel, and Naveen, 2006; and DeYoung et al., 2010). First, we compute the standard deviation of the daily stock return residuals estimated from the market model from July 2007 to December 2008 as a proxy for banks' overall risk exposure (*IdioRisk\_july07\_dec08*). Second, we estimate bond returns between July 2007 and December 2008 (*Bondret\_jul07\_dec08*). We calculate bond performance during the Crisis period at the bond issue level, computing the price difference of the bond from the beginning to the end of the period and adding accrued interest.<sup>22</sup>

Next, we calculate value-at-risk (VaR) and expected shortfall (ES) from July 2007 to December 2008. These two measures capture important features of the left tails of banks' returns distributions and are widely used by banks and other financial institutions to measure and disclose downside risk. VaR represents the worst expected portfolio loss over a given holding period within a given confidence interval. For example, a one-day 99% VaR of 4% means that over the next trading day, the bank expects with 99% confidence that any loss will not exceed 4%. Though financial institutions typically focus their VaR analyses on expected portfolio risk, we take an ex post approach, using banks' historical daily stock returns as a proxy for realized

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<sup>21</sup> It is generally believed that the Global Financial Crisis began in the summer of 2007 as a result of the liquidity crisis in the United States banking system (Reinhart and Rogoff, 2009).

<sup>22</sup> Note that we do not estimate yield to maturity because we focus on bond performance during the Crisis period.

firm risk during the Financial Crisis. We calculate banks' 99% one-day VaR in the Crisis (*VaR\_0708\_1pct*) by identifying the worst one-day loss that exceeds (i.e., is more positive than) the lowest 1% of daily returns in the calendar years 2007 and 2008, and then averaging the two.

To complement our VaR measure, we also compute ES (*ES\_0708\_1pct*), which captures the magnitude of expected losses in extreme scenarios—that is, when the VaR threshold is crossed. Because we use actual returns data, in our case ES is the average one-day loss in the worst 1% of cases. As with *var\_0708*, we determine ES for 2007 and 2008 and then average the two to get *es\_0708*. Since all the returns in the left tails of the distributions are negative, to facilitate interpretation of our results, we define *var\_0708* as -1 times the maximum likely loss and *es\_0708* as -1 times the average one-day loss among the worst cases. So negative coefficients on our inside debt measures would demonstrate that higher inside debt reduces risk.

Finally, we examine two measures of bank-specific risk-taking activities during the Crisis using bank holding companies' FRY-9C filings with the Federal Reserve. The bank's loan loss provision reflects the quality of a bank's loan portfolio. Therefore, as a proxy for risk taking, we use the average annual provision for loan and lease losses divided by total assets in 2007 and 2008 (*Provisions\_0708*; see DeYoung et al. 2010, for example). We also examine banks' level of mortgage-backed securities (MBS) investments in 2007 and 2008 because banks' losses from investments in sub-prime mortgage-backed securities were an important factor precipitating banks' liquidity crunch and their large declines in capital during the Global Financial Crisis. *Private MBS\_0708* is the average of the fair value of private mortgage-backed securities on the balance sheet scaled by total assets in 2007 and 2008 (see also DeYoung et al., 2010). This measure is calculated as the difference between total MBS and agency MBS (MBS issued by Fannie Mae, Freddie Mac, or Ginnie Mae and backed by conforming mortgages).

### 3.3 Regression Specifications

Our analyses explore the relation between banks' performance and risk taking during the Global Financial Crisis and bank CEOs' inside debt holdings at the end of year 2006. Specifically, we estimate the following equation using ordinary least squares (OLS):

$$\begin{aligned} \text{Performance or Risk Taking Measures} = & \\ & \text{Intercept} + \alpha 1 * \text{Proxy of the CEO's inside debt holdings} \\ & + \beta 1 * \text{Ret}_{2006} + \beta 2 * \text{ROA}_{2006} + \beta 3 * \text{Log Market value} \\ & + \beta 4 * \text{Book-to-market} + \beta 5 * \text{Leverage} + \beta 6 * \text{Tier 1 cap ratio} \\ & + \beta 7 * \text{CEO age} + \beta 8 * \text{Tenure as CEO} + \varepsilon \end{aligned}$$

We measure our control variables at the end of 2006.<sup>23</sup> We include past returns (*Ret<sub>2006</sub>*), past accounting performance (*ROA<sub>2006</sub>*), size (*Log Market value*), and the book-to-market ratio (*Book-to-market*), which are known determinants of firm performance and risk taking activities. To control for banks' financial strength, we include *Tier 1 cap ratio*, defined as the ratio of a bank's Tier 1 capital to its risk-adjusted assets. Tier 1 capital is the key measure of a bank's financial strength for regulators, and it consists primarily of the bank's common stock and retained earnings. We additionally control for the leverage of the bank (*Liabilities/ Assets*), defined as total liabilities scaled by total assets.

Finally, we control for both the age (*CEO age*) and tenure (*Tenure as CEO*) of the CEOs to address the concern that these factors might be driving our results. Sundaram and Yermack

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<sup>23</sup> See Appendix 1 for detailed definition of variables used in the empirical analysis.

(2007) find a positive association between the CEO's age and her level of inside debt. We measure tenure as the number of years that the CEO has been the CEO of the bank.

## 4 Empirical Results

### 4.1 Descriptive Statistics

Table 2 presents summary statistics relating to bank characteristics and bank performance and risk taking for the sample banks during the Crisis. The sample banks are large financial institutions relative to typical commercial banks: the mean (median) market value is \$14.81 (\$1.71) billion. The mean (median) Tier 1 capital ratio is 0.100 (0.098), which suggests that our sample banks are well capitalized.

With regard to performance measures, the mean (median) stock returns between July 2007 and December 2008 (*Ret\_july07\_dec08*) are -18% (-19%), in contrast to the positive stock returns for fiscal year 2006 (*Ret\_2006*) with a mean (median) of 10.1% (9.2%). This is consistent with the fact that banks experienced substantial drops in stock price during the Global Financial Crisis beginning in the summer of 2007. Accounting performance measures for the same period (*ROA\_q307\_q408* and *ROE\_q307\_q408*) further indicate that banks experienced severe financial difficulty during the Crisis.

With regard to risk taking measures, the mean (median) *IdioRisk\_july07\_dec08* is 0.716 (0.588). These risk measures are substantially higher than they were before the Crisis (see, DeYoung et al. 2010 for descriptive statistics between 1994 and 2006), supporting the notion that banks' exposure to risk increased substantially during the Crisis. The mean (median) *BondRet\_july07dec08* is -0.077 (0.003), the mean (median) *Var\_0708\_1pct* is 0.139 (0.117), and the mean (median) *ES\_0708\_1pct* is 0.182 (0.140). The mean (median) *Provisions* is 0.8%

(0.6%) in 2007 and 2008, and banks on average invested 1.2% of total assets in private MBS during this period.

Table 3 provides summary statistics of bank CEO characteristics, including annual compensation, personal wealth portfolio, inside debt position, and personal characteristics. The median inside debt for bank CEOs was \$2.65 million in 2006, compared to a median of \$5.2 million for CEOs of non-financial firms (Wei and Yermack, 2011). On the other hand, the median value of bank CEOs' equity portfolios was \$35.35 million, similar to a median of \$35 million for CEOs of non-financial firms (Wei and Yermack, 2011). As a result, the median bank CEO has a personal inside debt-equity ratio of 0.078 and a bank relative incentive ratio of 0.010, which is far below the comparable figures for CEOs of non-financial firms (median of 0.17 for the personal debt-equity ratio, and 0.55 for the relative incentive ratio (though the latter is not directly comparable because of overweighting of banks' insured deposits)). These statistics on inside debt holdings could suggest that firms and their investors expect regulatory oversight to curb managerial risk shifting. Alternatively, it may be that bank CEOs take excessive risk partly because they have relatively low inside debt-equity ratios, a result that is consistent with shareholder interests. Since deposit insurance premiums do not price risk, shareholders would rationally keep debt incentives low and equity incentives high because they want their CEOs to take advantage of the government subsidy that reduces banks' borrowing costs. Finally, the average age of the bank CEOs is 57, and the average tenure as the bank's CEO is about 10 years.

Table 4 presents summary statistics on bank performance and risk taking during the Crisis, as well as bank characteristics and CEO characteristics, for sub-samples partitioned by bank CEOs' inside debt holdings. Panel A partitions the sample using bank CEOs' personal inside debt-equity ratio. In general, financial institutions with higher CEO inside debt-equity

ratios before the Crisis perform better, have lower risk exposure (but lower bond returns), and issue less risky loans during the Crisis than those with lower CEO inside debt-equity ratios.<sup>24</sup> These results are generally consistent with our hypothesis that banks with higher CEO debt-equity ratios are likely to take less risk and perform better during the Crisis than those with lower CEO debt-equity ratios.

Bank characteristics are generally similar across the two sub-samples, though banks with lower CEO debt-equity ratios have higher leverage. When we compare CEO characteristics across the two sub-samples, we find a number of differences. Bank CEOs with higher inside debt-equity ratios earn lower salaries and total compensation, own smaller equity portfolios, are older, and have longer tenure as the CEO of the bank compared to those with lower inside debt-equity ratios. Thus, it is important to control for these differences in the regression analyses.

Panel B reports these statistics using our alternative proxy of bank CEOs' inside debt holdings—their bank relative incentive ratios—to partition the sample. The results are similar to those presented in Panel A.

## 4.2 Regression Results

### 4.2.1 Banks' Performance

In this section, we present the results of regression analyses. We begin by examining the effect of CEOs' inside debt holdings before the Global Financial Crisis on banks' financial performance during the Crisis, using two alternative financial performance measures, *Ret\_jul07\_dec08* and *ROA\_q307\_q408*. As earlier noted, we expect a positive relation between CEO inside debt holdings and bank performance during the Crisis because we hypothesize that

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<sup>24</sup> Note that it is difficult to draw inferences solely from the magnitude of bond returns because each bond has its own maturity and rating. We control these factors in the regressions below.

higher inside debt leads to lower risk taking, and we expect lower risk to lead to better performance in the Crisis environment.

Table 5 shows the regression results when the dependent variable is *Ret\_jul07\_dec08*. Columns (1) and (2) present the results using bank CEOs' personal inside debt-equity ratio as our proxy for inside debt incentives. Column (1) reports the baseline results when we include bank and CEO characteristics as control variables. Column (2) adds the *Tier 1 cap ratio* control. Consistent with our hypothesis, the coefficient on bank CEOs' personal debt-equity ratio is positive and significant in both regressions. The economic effects of the results are also notable. The column (1) estimates suggest that holding all other variables constant, for a bank in the 90<sup>th</sup> percentile for CEO personal inside debt-equity ratio (0.352), *Ret\_jul07\_dec08* is 23.7% higher (the coefficient of 0.674 multiply by 0.352), or shareholder value is \$406 million higher (using the median market value of banks in 2006), than for a bank in the 10<sup>th</sup> percentile (0).

With regard to our controls, we find that stock returns in fiscal year 2006 (*Ret\_2006*) and the book-to-market ratio (*Book-to-market*) are negatively related to stock performance during the Crisis. Leverage is negatively related to stock returns in column (1), but its significance disappears when we include the additional control for *Tier 1 cap ratio* in column 2,<sup>25</sup> which is also not significant. CEO characteristics show no significant association with banks' stock performance in the Crisis.

Columns (3) and (4) present the results when we use our alternative proxy for bank CEOs' inside debt holdings, the bank CEOs' relative incentive ratio. Column (3) is our base case, with column (4) including *Tier 1 cap ratio* as a control. The coefficient on the bank CEOs'

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<sup>25</sup> This loss of significance occurs because the two variables are highly correlated, i.e., there is multicollinearity.

relative incentive ratio remains positive and significant. The results on control variables are very similar to those in columns (1) and (2).

Table 6 presents the regression results when the dependent variable is *ROA\_q307\_q408*.<sup>26</sup> Columns (1) and (2) report the results when we use bank CEOs' personal inside debt-equity ratio; columns (3) and (4) report the results when we use bank CEOs' relative incentive ratio. Consistent with our hypothesis, the coefficients on the two proxies for bank CEOs' inside debt holdings are positive, but they are only significant in columns (1) and (2).

In summary, we find that bank CEOs' inside debt holdings preceding the Crisis are positively associated with bank performance during the Crisis.

#### 4.2.2 Banks' Risk Taking

Next, we turn to banks' risk taking during the Crisis. We first examine one overall risk exposure measure, *IdioRisk\_july07\_dec08*.<sup>27</sup> The effect of CEOs' pre-Crisis inside debt holdings on banks' risk exposure during the Crisis is measured by the coefficient on the proxy for CEOs' inside debt holdings, and we expect a negative sign on this coefficient.

Table 7 presents the regression results. Columns (1) and (2) show the results when we use bank CEOs' personal inside debt-equity ratio. As with the previous tables, column (1) reports the baseline results when we include bank and CEO characteristics as controls, and column (2) includes the *Tier 1 cap ratio* control. Consistent with our hypothesis, the coefficient on bank CEOs' personal debt-equity ratio is negative and significant in both specifications. In terms of economic effects, column (1) estimates suggest that, by holding all other variables

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<sup>26</sup> As a robustness check, we also run regressions using return on equity during the Crisis as the dependent variable (*ROE\_q307\_q408*). We find results similar to and statistically more significant than those reported in Table 6.

<sup>27</sup> As a robustness check, we run regression using total risk exposure during the Crisis, measured as the standard deviation of daily stock returns from July 2007 to December 2008. We find qualitatively similar results as those reported in Table 7.

constant, *IdioRisk\_july07\_dec08* is lower by 0.162, or 44% of one standard deviation lower (using the standard deviation of *IdioRisk\_july07\_dec08* of 0.364), for a bank in the 90<sup>th</sup> percentile of CEOs' personal inside debt-equity ratio (0.352) relative to a bank in the 10<sup>th</sup> percentile (0).

With regard to controls, we find that banks with a higher *Tier 1 cap ratio* reduce overall risk exposure during the Crisis, while banks with higher *Book-to-market* have more overall risk exposure. Columns (3) and (4) present the results when we use our alternative proxy for bank CEOs' inside debt holdings, the bank CEOs' relative incentive ratio. We find that the coefficient on the bank CEOs' relative incentive ratio remains negative and significant in both specifications. The results on control variables are similar to those in columns (1) and (2).

In Table 8, we use bank bond returns as our measure of bank risk. Because the unit of observation in the regressions is the bond issue, it is possible that banks with multiple bond issues might skew the results. However, only 20 sample banks have bond pricing data available from Bloomberg, and so we are left with few degrees of freedom in our analysis. To mitigate this issue, we calculate robust standard errors clustered at the bank level. Since bond returns are generally negatively correlated with risk, we expect a positive association between our proxies for CEOs' pre-Crisis inside debt incentives and bond returns. Columns (1) and (2) use the CEO's personal inside debt-equity ratio as our proxy. The baseline case in column (1) includes controls for bond terms—whether the bond is callable (*Callable*) and the bond's rating (*Bond rating*) and maturity (*Maturity*). Column (2) includes controls for bank and CEO characteristics. As we expect, the coefficient on the CEO's personal inside debt-equity ratio is positive and significant in both specifications. Columns (3) and (4) in Table 8 show the results when we use

the bank CEO's relative incentive ratio as our proxy for CEO inside debt holdings. Again, the coefficient on bank CEO relative incentive ratio is positive and significant in both specifications.

In Table 9, we use VaR and ES as our dependent variables in order to measure downside risk. The dependent variable in Panel A is *VaR\_0708\_1pct*, which again represents one-day 99% VaR for 2007 and 2008.<sup>28</sup> Columns (1) and (2) use CEO personal debt-equity ratio as our proxy for inside debt incentives. The baseline case in Column (1) returns a negative coefficient, consistent with our hypothesis that higher inside debt reduces downside risk, but the result is not significant. When we add our *Tier 1 cap ratio* control, the coefficient on CEO personal debt-equity ratio becomes negative and significant. *Tier 1 cap ratio* again shows a negative and significant coefficient, consistent with its role in reducing downside risk. In columns (3) and (4), we use the bank CEO relative incentive ratio as our proxy. As with CEO personal debt-equity ratio, the coefficient on bank CEO relative incentive ratio is negative in both specifications, and becomes significant with the inclusion of the *Tier 1 cap ratio* control. *Book-to-market* is positively associated with downside risk in all specifications.

In Panel B of Table 9, the dependent variable is *ES\_0708\_pct1*, which represents the average one-day loss in the worst 1% of daily returns in 2007 and 2008. Columns (1) and (2) show the results using CEO personal debt-equity ratio as our proxy for inside debt incentives and controlling for bank and CEO characteristics. The coefficient on CEO personal debt-equity ratio is negative and significant in both specifications, suggesting that inside debt reduces losses in extreme scenarios and supporting our hypothesis that inside debt promotes lower risk taking. The coefficient on *Tier 1 cap ratio* in column (2) is again negative and significant as well. In Columns (3) and (4), we use bank CEO relative incentive ratio as our proxy. Here as well, the

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<sup>28</sup> Using one-day 95% VAR and ES produces qualitatively similar results.

coefficient on our proxy is negative and significant in both models, with the *Tier 1 cap ratio* control negative and significant as well.

Finally, we study the effect of CEOs' inside debt holdings before the Global Financial Crisis on banks' specific risk taking activities during the Crisis. We examine two measures of risk taking activities, *Provisions\_0708* and *Private MBS\_0708*. Table 10 presents the regression results. Note that requiring data from the FR Y-9C filings reduces the sample to only 64 banks.

Columns (1) and (2) report the regression results when the dependent variable is *Provisions\_0708*. Column (1) uses CEO personal debt-equity ratio as our proxy for inside debt incentives; column (2) uses bank CEO relative incentive ratio. The coefficients on both proxies are negative, but it is significant only in column (1). This suggests that banks with higher CEO inside debt incentives tend to issue less risky loans. Firm size is negatively related to *Provisions\_0708*, and the book-to-market ratio is positively related to *Provisions\_0708*. Columns (3) and (4) report the regression results when the dependent variable is *Private MBS\_0708*. The coefficients on both proxies are negative, but they are not statistically significant.

We recognize that our measures of specific risk taking activities may trigger some endogeneity concerns. Not only may CEOs determine the overall riskiness of their banks' loan portfolios and the level of their MBS holdings, but CEOs may also enjoy some discretion as to the setting of loan loss provisions and the valuing of MBS holdings on their balance sheets. So for example, a CEO may take large risks and then later attempt to camouflage losses by choosing artificially low levels of loan loss provisions or higher MBS valuations. However, given our use of multiple risk measures and estimations, we are confident that taken together, our results in this section offer evidence that bank CEOs' inside debt holdings preceding the Crisis are significantly negatively associated with bank risk taking during the Crisis.

### 4.2.3 Post-Crisis Tests

To test the generality of our results, we explore the relation between CEOs' inside debt holdings and bank performance and risk taking outside of the Crisis environment. We run the same regressions for idiosyncratic risk, bond returns, and stock performance described in the tables above, but measuring our inside debt and control variables at the end of 2008 and our dependent variables in 2009. We report our post-Crisis results in Appendix 5. [to come]

## 4.3 Additional Analysis

In this section, we perform several additional analyses. First, we address the issue of CEO risk aversion. Next, we address endogeneity concerns. Finally, we address the possibility that extreme observations may be driving our results.

### 4.3.1 CEO Risk Aversion

The extant empirical literature on inside debt has not focused on potential CEO risk aversion. Existing analyses, like our earlier analysis, treat CEO stock holdings as belonging on the risk-inducing side of the ledger of CEOs' portfolio incentives, essentially assuming risk-neutral CEOs. The conventional wisdom in the pay-for-performance literature, however, is that for risk averse CEOs, large stock holdings may not induce more risk taking but less (Core, Guay, and Larker, 2003), and that option holdings offer a more reliable device to incentivize risk taking (Edmans and Gabaix, 2011; Guay, 1999). It may be that above certain levels of stock ownership, undiversified CEOs may prefer lower firm risk (May, 1995). We augment the inside debt compensation literature by extending our analysis to account for this potential effect of CEO risk aversion.

Because stock incentives may be ambiguous with respect to risk taking under certain conditions,<sup>29</sup> we rerun all of our tests using CEO options as the only component of CEO equity holdings. Our proxies for CEOs' risk-taking incentives then become (a) the CEO's personal inside debt-options ratio and [(b) the bank CEO's relative incentive ratio calculated with only CEO option holdings included in her equity portfolio.] Our regressions using this approach (unreported) show results that are qualitatively similar to those reported in the paper, suggesting that inside debt incentives operate even within the more realistic setting of CEO risk aversion.

#### 4.3.2 Endogeneity

Next, we address endogeneity concerns. The cross-sectional structure of our model does not allow us to make strong causal inferences from the data, and we cannot rule out other explanations for the observed association between CEO inside debt holdings and bank performance and risk taking. One possibility is that an unobserved omitted factor may be affecting both CEOs' inside debt levels and bank risk taking. For example, firm culture or technology may be driving our results. Cheng, Hong and Scheinkman (2012) find that individual financial firms' risk taking—as measured by ex post market beta, return volatility, and stock price exposure to the ABX index—is highly persistent across time. They suggest that firm culture or technology may explain this persistence. Or perhaps bank CEO risk aversion may be driving our results. A risk-averse banker would likely both prefer less risky business strategies and demand relatively more compensation in the form of pensions and deferred compensation, and less in equity compensation.

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<sup>29</sup> In-the-money options may also have ambiguous effects on risk taking: Greater “moneyness” reduces vega (Core and Guay, 2002) and therefore reduces risk taking incentives (Low 2009). To the extent that moneyness affects our sample, it merely biases our results against us.

We run unreported reverse causality tests to determine whether bank performance or risk taking before 2006 affects CEOs' inside debt holdings in 2006. If firm culture or bank CEO risk aversion were driving our results, we should see some correlation between pre-2006 risk taking or performance and CEO inside debt holdings in 2006. For one-, two-, and three-year periods preceding year-end 2006, we find no significant effects of bank performance or idiosyncratic risk on our proxies for CEOs' inside debt holdings. This provides some evidence suggesting that our casual interpretation—that CEOs' inside debt incentives drive risk taking at the bank—is more plausible.

### 4.3.3 Extreme Observations

Finally, we address a concern that our results may be driven by a relative handful of extreme observations. Several big banks failed during the Global Financial Crisis, and most of them are included in our sample. The seven failed banks in our sample had extremely poor financial performance during the Crisis.<sup>30</sup> Notably, the average stock returns during the Crisis for these seven banks were -75%, compared to -12% for the rest of the sample.<sup>31</sup> In addition, the average CEO's personal inside debt-equity ratio for the seven banks was only 0.06, in contrast to a ratio of 0.12 for the rest of the sample.

It is possible that these extreme observations are the main driver of our results, and the disciplining role of inside debt may not apply as strongly—if at all—to the surviving banks. To address this issue, we repeat our empirical tests excluding these seven failed banks. The results we obtain are similar to our reported results, reinforcing the generalizability of our main results.

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<sup>30</sup> The seven failed banks are: Countrywide Financial Corp, Downey Financial Corp, Wachovia Corp, Indymac Bancorp Inc, Washington Mutual Inc, Fremont General Corp, and Franklin Bank Corp.

<sup>31</sup> Returns for these failed banks are estimated from July 2007 to the date they were delisted from the stock exchange.

## 5. Conclusion

We offer a new approach to investigating the link between banker compensation before the Global Financial Crisis and bank performance during the Crisis. While studies to date have focused exclusively on equity-based compensation, we believe ours to be the first analysis of the effects of bank CEO inside debt holdings on bank performance in the Crisis.

We show that CEOs' inside debt holdings preceding the Crisis are significantly positively associated with bank performance and significantly negatively associated with bank risk taking during the Crisis. Our results are consistent with the existing theoretical and empirical literature on inside debt incentives, though ours is the first study to demonstrate inside debt effects within the highly regulated environment of commercial banking. We use two alternative proxies for CEOs' inside debt holdings: the CEOs' personal inside debt-equity ratio and the bank CEOs' relative incentive ratio. For bank performance, we rely on stock returns and accounting return on assets. We measure bank risk taking with two measures of overall bank risk exposure and two distinct measures of banks' risk taking activities.

We recognize that the cross-sectional structure of our model does not allow us to make strong causal inferences from the data. However, we offer additional tests that tend to mitigate endogeneity concerns. Our paper is timely, given the current policy focus on the structure of executive compensation at banks. The existence and use of inside debt compensation is worthy of future study, in the banking context as well as others.

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**Table 1: Sample Selection**

<b>Banks with SIC codes 6020, 6035, 6036, 6162, 6199 in 2006 EXECUCOMP</b>	<b>113</b>
<b>Less American Express</b>	<b>(1)</b>
<b>Less banks with fiscal year end before December</b>	<b>(2)</b>
<b>Less banks experiencing CEO turnovers during 2006 and 2007</b>	<b>(16)</b>
<b>Less banks experiencing M&amp;A during 2006 and 2007</b>	<b>(11)</b>
<b>Banks in the sample during Financial Crisis</b>	<b>83</b>

This table presents the sample selection process.

**Table 2: Summary Statistics of Banks in the Sample**

Variable	N	Q1	Median	Q3	Mean	Std. Dev
<b><u>Bank Characteristics</u></b>						
Assets	83	5,487.190	10,185.880	22,784.250	93,572.230	307,264.890
Liabilities	83	4,385.000	9,213.260	20,726.910	85,645.620	283,053.210
Market value	83	943.898	1,709.290	4,495.160	14,808.340	45,867.390
Cash/Assets	83	0.024	0.037	0.053	0.051	0.054
Div. per share	83	0.400	0.762	1.140	0.841	0.556
Book-to-market	83	0.876	0.917	0.946	0.909	0.051
Tier 1 cap ratio	78	0.087	0.098	0.113	0.100	0.018
Liabilities / Market Value	83	3.813	4.678	5.966	5.297	2.670
Liabilities / Assets	83	0.892	0.908	0.921	0.902	0.030
Insured Deposits	83	1845.190	4514.120	9449.740	21144.370	58238.690
Total Deposits	83	3552.630	7254.610	13383.370	49130.670	144888.180
Insured Deposits/Liabilities		0.367	0.464	0.585	0.463	0.179
ROA_2006	83	0.009	0.012	0.014	0.011	0.005
ROE_2006	83	0.093	0.128	0.153	0.125	0.059
Ret_2006	83	-0.005	0.092	0.195	0.101	0.145
<b><u>Bank Performance during the GFC</u></b>						
Ret_july07_dec08	83	-0.466	-0.189	0.088	-0.176	0.416
ROA_q307_q408	83	-0.020	0.008	0.015	-0.004	0.028
ROE_q307_q408	83	-0.259	0.065	0.157	-0.036	0.274
<b><u>Bank Risk-taking during the GFC</u></b>						
IdioRisk_july07dec08	83	0.486	0.588	0.818	0.716	0.364
BondRet_july07dec08	204	-0.121	0.003	0.079	-0.077	0.251
Provision_0708	65	0.003	0.006	0.011	0.008	0.008
Private MBS_0708	65	0.000	0.005	0.018	0.012	0.018
ES_0708_1pct	83	0.118	0.140	0.174	0.182	0.124
VaR_0708_1pct	83	0.094	0.117	0.141	0.139	0.084

The table presents summary statistics for sample banks. See Appendix 1 for variable definitions and measurements.

**Table 3: Summary Statistics of CEO Characteristics**

Variable	N	Q1	Median	Q3	Mean	Std. Dev
<b><u>CEO Annual Compensation</u></b>						
Total Comp	82	1,100.43	1,951.98	4,038.24	5,152.11	8,635.48
Salary	83	500.00	672.92	927.00	715.02	359.75
Annual option awards FV	83	0.00	103.16	949.44	1,297.51	3,300.70
Annual stock awards FV	83	0.00	0.00	1,087.20	1,365.46	3,206.34
<b><u>CEO Wealth Portfolio</u></b>						
Deferred comp value	83	0.00	344.64	2,722.28	2,922.68	6,119.42
Pension value	83	0.00	950.34	4,447.70	3,795.81	7,212.01
Inside debt	83	413.25	2,648.36	6,874.21	6,718.49	12,234.28
Option value	83	1,334.18	3,997.43	18,988.40	15,041.43	33,079.66
Stock value	83	10,705.40	28,274.10	91,040.94	74,852.47	103,785.86
Restricted share value	83	0.00	149.14	1,524.98	2,485.56	6,946.49
Total equity value	83	14,796.80	35,354.72	115,271.48	92,379.46	129,925.74
<b><u>CEO Inside Debt</u></b>						
CEO debt-equity ratio	83	0.012	0.078	0.177	0.117	0.137
CEO relative incentive ratio	81	0.002	0.013	0.032	0.022	0.026
Bank CEO relative incentive ratio	81	0.002	0.010	0.021	0.015	0.017
<b><u>CEO Personal Characteristics</u></b>						
CEO age	83	53.00	58.00	61.00	57.07	7.05
Tenure as CEO	83	4.00	7.00	15.00	9.65	7.20

The table presents summary statistics for CEOs of sample banks. See Appendix 1 for variable definitions and measurements.

**Table 4: Summary Statistics of Bank Performance and Risk-Taking during the Global Financial Crisis, Bank Characteristics, and CEO Characteristics for Sub-Samples Partitioned by the CEO's Inside Debt Holdings**

Panel A: Partitioned by the CEO's debt-equity ratio

	Low CEO debt-equity ratio (N=41)			High CEO debt-equity ratio (N=42)		
	Mean	Median	Std Dev	Mean	Median	Std Dev
<b><u>Performance during the GFC</u></b>						
Ret_july07_dec08	-0.203	-0.201	0.492	-0.149	-0.186	0.331
ROA_q307_q408	-0.003	0.006	0.025	-0.005	0.009	0.031
ROE_q307_q408	-0.046	0.064	0.282	-0.027	0.065	0.270
<b><u>Risk-Taking during the GFC</u></b>						
IdioRisk_july07dec08	0.735	0.579	0.431	0.698	0.601	0.290
Bondret_july07dec08 (N = 117-Low & 87-High)	-0.022	0.007	0.142	-0.153	-0.002	0.335
Provisions_0708	0.009	0.007	0.010	0.008	0.006	0.006
Private_mbs_0708	0.012	0.006	0.014	0.012	0.005	0.021
ES_0708_1pct	0.195	0.148	0.133	0.169	0.135	0.115
VaR_0708_1pct	0.142	0.117	0.088	0.136	0.117	0.082
<b><u>Bank Characteristics</u></b>						
Book-to-market	0.905	0.915	0.060	0.913	0.924	0.041
Tier 1 cap ratio	0.103	0.100	0.020	0.098	0.096	0.016
Liabilities / Market Value	5.684	4.767	3.436	4.920	4.557	1.562
Liabilities / Assets	0.908	0.913	0.022	0.897	0.906	0.036
Insured Deposits/Liabilities	0.456	0.458	0.196	0.469	0.470	0.163
Assets	123,689.797	10,346.414	371,872.146	64,171.749	9,562.120	228,286.854
Market Value	19,026.625	1,746.307	53,656.734	10,690.484	1,648.112	36,927.592
<b><u>CEO Compensation, Incentives, and Personal Characteristics</u></b>						
Total comp	6,026.06	1,937.15	1,0901.55	4,278.17	1,966.82	5,531.53
Salary	732.36	672.92	452.61	698.08	669.41	241.63
Inside debt	3,567.34	468.12	9,076.33	9,794.62	5,879.58	14,119.55
Total equity value	128,607.70	59,461.65	159,269.06	57,013.79	31,393.77	80,123.27
CEO age	55.61	56.00	7.59	58.50	58.00	6.24
Tenure as CEO	8.80	6.00	7.37	10.48	9.00	7.03

Panel B: Partitioned by the bank CEO relative incentive ratio

	Low bank CEO relative incentive ratio (N=40)			High bank CEO relative incentive ratio (N=41)		
	Mean	Median	Std Dev	Mean	Median	Std Dev
<b><u>Performance during the GFC</u></b>						
Ret_july07_dec08	-0.237	-0.224	0.493	-0.108	-0.078	0.317
ROA_q307_q408	-0.006	0.001	0.025	-0.002	0.009	0.032
ROE_q307_q408	-0.072	0.013	0.289	0.001	0.096	0.264
<b><u>Risk-Taking during the GFC</u></b>						
IdioRisk_july07dec08	0.800	0.608	0.453	0.646	0.585	0.239
Bondret_july07dec08 (N = 99-Low & 87-High)	-0.173	-0.056	0.317	0.018	0.053	0.115
Provisions_0708	0.010	0.007	0.010	0.007	0.006	0.006
Private_mbs_0708	0.011	0.004	0.014	0.013	0.005	0.021
ES_0708_1pct	0.207	0.150	0.147	0.159	0.133	0.095
VaR_0708_1pct	0.156	0.120	0.106	0.123	0.112	0.055
<b><u>Bank Characteristics</u></b>						
Book-to-market	0.915	0.922	0.047	0.903	0.910	0.055
Tier 1 cap ratio	0.101	0.099	0.021	0.100	0.098	0.015
Liabilities / Market Value	5.939	5.249	3.370	4.693	4.277	1.549
Liabilities / Assets	0.909	0.914	0.022	0.899	0.905	0.028
Insured Deposits/Liabilities	0.453	0.462	0.182	0.474	0.476	0.176
Assets	119,057.437	10,299.493	373,500.678	68,338.497	9,828.652	236,084.401
Market Value	16,923.392	1,675.041	51,972.691	12,841.769	1,709.294	40,784.032
<b><u>CEO Compensation, Incentives, and Personal Characteristics</u></b>						
Total comp	4,875.669	1,927.997	8,833.990	4,584.652	2,066.042	6,267.733
Salary	687.585	661.459	295.716	693.812	673.215	249.479
Inside debt	2,323.792	461.088	5,405.340	10,167.571	6,627.043	14,530.481
Total equity value	111,318.844	47,061.686	129,569.690	61,670.918	33,341.346	93,739.047
CEO age	55.325	56.000	7.385	58.146	58.000	5.986
Tenure as CEO	9.325	6.000	8.191	10.000	9.000	6.380

The table presents summary statistics for sample banks and the CEOs of these banks. The summary statistics are presented for two sub-samples: the low CEO inside debt-equity ratio sub-sample (below the median proxy) and the high CEO inside debt-equity ratio sub-sample (above the median proxy). Panel A is based on the CEO's personal debt-equity ratio, and panel B is based on the bank CEO's relative debt-equity ratio. See Appendix 1 for variable definitions and measurements.

**Table 5: CEOs' Inside Debt and Bank Stock Return Performance during the Global Financial Crisis**

	(1)	(2)	(3)	(4)
<b>CEO debt-equity ratio</b>	0.674**	0.749**		
	(2.24)	(2.54)		
<b>Bank CEO relative inc. ratio</b>			4.320*	4.812*
			(1.69)	(1.99)
<b>Ret_2006</b>	-0.838**	-1.024***	-0.818**	-0.971**
	(2.26)	(2.96)	(2.04)	(2.60)
<b>ROA_2006</b>	-2.327	-21.844	-2.985	-20.734
	(0.18)	(1.63)	(0.24)	(1.51)
<b>Log Market value</b>	-0.005	0.035	-0.007	0.032
	(0.20)	(1.21)	(0.24)	(1.10)
<b>Book-to-market</b>	-3.737***	-4.118***	-3.370***	-3.644***
	(3.95)	(3.57)	(3.43)	(3.05)
<b>Liabilities/Assets</b>	-2.486**	-2.076	-2.678*	-1.872
	(2.24)	(1.17)	(1.72)	(1.05)
<b>CEO age</b>	-0.008	-0.009	-0.006	-0.008
	(1.28)	(1.30)	(0.87)	(1.12)
<b>Tenure as CEO</b>	0.005	0.005	0.004	0.005
	(0.72)	(0.69)	(0.67)	(0.70)
<b>Tier 1 cap ratio</b>		4.301		4.359
		(1.57)		(1.51)
<b>Constant</b>	5.966***	5.492**	5.733***	4.825*
	(4.08)	(2.28)	(3.12)	(1.93)
<b>Observations</b>	83	78	81	78
<b>R-squared</b>	0.24	0.26	0.21	0.24

The table presents the OLS regression results of estimating banks' stock return performance during the Global Financial Crisis. The dependent variable is buy-and-hold returns from July 2007 to December 2008 (Ret\_July07\_Dec08). See Appendix 1 for variable definitions and measurements. T-statistics in parentheses are calculated using robust standard errors. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10% levels (two-sided tests).

**Table 6: CEOs' Inside Debt and Bank Accounting Performance during the Global Financial Crisis: ROA**

	(1)	(2)	(3)	(4)
<b>CEO debt-equity ratio</b>	0.028*	0.032*		
	(1.79)	(1.84)		
<b>Bank CEO relative inc. ratio</b>			0.141	0.162
			(0.99)	(1.15)
<b>Ret_2006</b>	-0.045*	-0.037	-0.039	-0.034
	(1.67)	(1.18)	(1.33)	(1.06)
<b>ROA_2006</b>	-0.319	-0.297	-0.202	-0.247
	(0.57)	(0.31)	(0.37)	(0.25)
<b>Log Market value</b>	0.002	0.004*	0.002	0.004*
	(1.19)	(1.85)	(1.07)	(1.77)
<b>Book-to-market</b>	-0.284***	-0.247***	-0.265***	-0.228***
	(4.47)	(3.40)	(4.34)	(3.16)
<b>Liabilities/Assets</b>	0.163	0.362	0.266	0.368
	(0.79)	(1.30)	(1.00)	(1.31)
<b>CEO age</b>	0.000	-0.000	0.000	0.000
	(0.38)	(0.10)	(0.24)	(0.09)
<b>Tenure as CEO</b>	-0.001**	-0.000	-0.001*	-0.000
	(2.09)	(1.32)	(1.96)	(1.29)
<b>Tier 1 cap ratio</b>		0.354*		0.352*
		(1.75)		(1.72)
<b>Constant</b>	0.089	-0.166	-0.017	-0.191
	(0.46)	(0.57)	(0.07)	(0.65)
<b>Observations</b>	83	78	81	78
<b>R-squared</b>	0.24	0.30	0.25	0.29

The table presents the OLS regression results of estimating banks' accounting performance during the Global Financial Crisis. The dependent variable is return on assets from the third quarter of 2007 to the fourth quarter of 2008 (ROA\_q307\_q408). See Appendix 1 for variable definitions and measurements. T-statistics in parentheses are calculated using robust standard errors. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10% levels (two-sided tests).

**Table 7: CEOs' Inside Debt and Bank Risk Taking during the Global Financial Crisis:  
Idiosyncratic Risk**

	(1)	(2)	(3)	(4)
<b>CEO debt-equity ratio</b>	-0.461*	-0.583**		
	(1.73)	(2.15)		
<b>Bank CEO relative inc. ratio</b>			-3.527*	-4.188**
			(1.72)	(2.09)
<b>Ret_2006</b>	0.639**	0.836***	0.702**	0.802***
	(2.30)	(3.47)	(2.46)	(3.33)
<b>ROA_2006</b>	1.415	12.774	2.873	11.931
	(0.15)	(0.86)	(0.30)	(0.80)
<b>Log Market value</b>	-0.036	-0.062*	-0.033	-0.061*
	(1.10)	(1.74)	(1.00)	(1.69)
<b>Book-to-market</b>	4.147***	4.462***	4.125***	4.082***
	(3.41)	(3.05)	(3.43)	(2.89)
<b>Liabilities/Assets</b>	2.328**	1.945	2.680*	1.757
	(2.25)	(1.35)	(1.88)	(1.21)
<b>CEO age</b>	0.001	0.003	0.002	0.002
	(0.22)	(0.46)	(0.36)	(0.35)
<b>Tenure as CEO</b>	0.001	-0.001	0.001	-0.001
	(0.26)	(0.16)	(0.13)	(0.20)
<b>Tier 1 cap ratio</b>		-5.817**		-5.909**
		(2.14)		(2.09)
<b>Constant</b>	-4.986***	-4.320*	-5.381***	-3.765
	(2.77)	(1.83)	(2.68)	(1.61)
<b>Observations</b>	83	78	81	78
<b>R-squared</b>	0.31	0.40	0.32	0.39

The table presents the OLS regression results of estimating banks' overall risk exposure during the Global Financial Crisis. The dependent variable is the standard deviation of daily stock return residuals from the market model estimated for the period July 2007 to December 2008 (IdioRisk\_july07\_dec08). See Appendix 1 for variable definitions and measurements. T-statistics in parentheses are calculated using robust standard errors. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10% levels (two-sided tests).

**Table 8: CEOs' Inside Debt and Bank Bond Return Performance during the Global Financial Crisis**

	(1)	(2)	(3)	(4)
<b>CEO debt-equity ratio</b>	0.352*** (3.73)	0.700*** (5.27)		
<b>Bank CEO relative inc. ratio</b>			3.118*** (3.84)	6.027*** (5.17)
<b>Callable</b>	-0.040 (1.64)	-0.135*** (3.10)	-0.073 (1.66)	-0.125*** (2.95)
<b>Bond rating</b>	0.075*** (7.69)	0.084*** (5.41)	0.072*** (7.29)	0.083*** (5.38)
<b>Maturity</b>	-0.001 (0.73)	-0.001 (0.62)	-0.001 (0.62)	-0.001 (0.60)
<b>Ret_2006</b>		0.676 (1.29)		0.623 (1.14)
<b>ROA_2006</b>		-6.025 (0.85)		-5.429 (0.75)
<b>Log Market value</b>		-0.028 (1.22)		-0.030 (1.22)
<b>Book-to-market</b>		1.120 (0.46)		1.388 (0.58)
<b>Liabilities/Assets</b>		-3.783* (1.81)		-3.954* (1.86)
<b>CEO age</b>		-0.015 (1.26)		-0.015 (1.25)
<b>Tenure as CEO</b>		0.018* (1.77)		0.017* (1.75)
<b>Tier 1 cap ratio</b>		4.004 (1.46)		3.825 (1.35)
<b>Constant</b>	-0.622*** (7.93)	2.314 (0.60)	-0.610*** (7.80)	2.252 (0.60)
<b>Observations</b>	204	148	186	148
<b>R-squared</b>	0.64	0.74	0.64	0.74

The table presents the OLS regression results of estimating banks' bond returns during the Global Financial Crisis. The dependent variable is bond returns from July 2007 to December 2008 (BondRet\_July07\_Dec08). See Appendix 1 for variable definitions and measurements. T-statistics in parentheses are calculated using robust standard errors clustered at banks. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10% levels (two-sided tests).

**Table 9: CEOs' Inside Debt and Tail Risk during the Global Financial Crisis**

**Panel A: VaR\_0708\_1pct**

	(1)	(2)	(3)	(4)
<b>CEO debt-equity ratio</b>	-0.076 (1.28)	-0.108* (1.77)		
<b>Bank CEO relative inc. ratio</b>			-0.612 (1.41)	-0.804* (1.81)
<b>Ret_2006</b>	0.111 (1.55)	0.155*** (3.10)	0.116 (1.55)	0.149*** (3.12)
<b>ROA_2006</b>	-3.689 (1.18)	0.989 (0.37)	-3.552 (1.11)	0.834 (0.31)
<b>Log Market value</b>	-0.000 (0.06)	-0.008 (0.90)	-0.000 (0.02)	-0.007 (0.87)
<b>Book-to-market</b>	0.616** (2.24)	0.682** (2.51)	0.592** (2.19)	0.611** (2.39)
<b>Liabilities/Assets</b>	0.459** (2.16)	0.286 (1.13)	0.480 (1.59)	0.249 (0.97)
<b>CEO age</b>	0.000 (0.03)	0.001 (0.70)	0.000 (0.07)	0.001 (0.64)
<b>Tenure as CEO</b>	-0.000 (0.06)	-0.001 (0.44)	-0.000 (0.11)	-0.001 (0.47)
<b>Tier 1 cap ratio</b>		-1.329** (2.02)		-1.349* (1.98)
<b>Constant</b>	-0.794* (1.99)	-0.613 (1.46)	-0.798* (1.72)	-0.507 (1.23)
<b>Observations</b>	83	78	81	78
<b>R-squared</b>	0.27	0.31	0.27	0.30

The panel presents the OLS regression results of estimating banks' tail risk during the Global Financial Crisis. The dependent variable is VaR\_0708\_1pct. See Appendix 1 for variable definitions and measurements. T-statistics in parentheses are calculated using robust standard errors. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10% levels (two-sided tests).

**Panel B: ES\_0708\_1pct**

	(1)	(2)	(3)	(4)
<b>CEO debt-equity ratio</b>	-0.152*	-0.202**		
	(1.88)	(2.44)		
<b>Bank CEO relative inc. ratio</b>			-1.356**	-1.642**
			(2.16)	(2.64)
<b>Ret_2006</b>	0.160	0.212***	0.162	0.203***
	(1.46)	(2.80)	(1.41)	(2.93)
<b>ROA_2006</b>	-8.850	-1.752	-8.810	-2.035
	(1.61)	(0.38)	(1.59)	(0.45)
<b>Log Market value</b>	0.008	-0.001	0.008	-0.000
	(0.65)	(0.05)	(0.69)	(0.03)
<b>Book-to-market</b>	0.372	0.450	0.301	0.314
	(0.74)	(0.89)	(0.60)	(0.65)
<b>Liabilities/Assets</b>	0.433	0.092	0.340	0.014
	(1.35)	(0.24)	(0.70)	(0.04)
<b>CEO age</b>	0.000	0.002	0.001	0.002
	(0.16)	(1.29)	(0.25)	(1.26)
<b>Tenure as CEO</b>	-0.000	-0.001	-0.000	-0.001
	(0.12)	(0.52)	(0.19)	(0.58)
<b>Tier 1 cap ratio</b>		-1.731**		-1.783**
		(2.09)		(2.07)
<b>Constant</b>	-0.525	-0.235	-0.389	-0.028
	(0.80)	(0.32)	(0.50)	(0.04)
<b>Observations</b>	83	78	81	78
<b>R-squared</b>	0.22	0.24	0.22	0.24

The panel presents the OLS regression results of estimating banks' tail risk during the Global Financial Crisis. The dependent variable is ES\_0708\_1pct. See Appendix 1 for variable definitions and measurements. T-statistics in parentheses are calculated using robust standard errors. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10% levels (two-sided tests).

**Table 10: CEOs' Inside Debt and Bank Risk Taking Activities during the Global Financial Crisis**

	(1)	(2)	(3)	(4)
	Provisions		Private MBS	
<b>CEO debt-equity ratio</b>	-0.012*		-0.012	
	(1.81)		(0.98)	
<b>Bank CEO relative inc. ratio</b>		-0.064		-0.121
		(1.38)		(1.51)
<b>Ret_2006</b>	0.016	0.015	0.014	0.013
	(1.66)	(1.49)	(0.75)	(0.76)
<b>ROA_2006</b>	0.532	0.505	1.326	1.297
	(0.88)	(0.81)	(0.77)	(0.76)
<b>Log Market value</b>	-0.002**	-0.002**	0.003	0.003
	(2.12)	(2.04)	(0.79)	(0.79)
<b>Book-to-market</b>	0.119**	0.108**	0.080	0.069
	(2.36)	(2.15)	(0.55)	(0.49)
<b>Liabilities/Assets</b>	0.061	0.057	0.159	0.152
	(1.29)	(1.17)	(1.61)	(1.56)
<b>CEO age</b>	0.000	0.000	-0.000	-0.000
	(0.54)	(0.28)	(0.38)	(0.34)
<b>Tenure as CEO</b>	0.000	0.000	0.001	0.001
	(0.88)	(0.88)	(1.57)	(1.53)
<b>Tier 1 cap ratio</b>	-0.002	0.006	0.146	0.137
	(0.02)	(0.07)	(0.55)	(0.51)
<b>Constant</b>	-0.152*	-0.137	-0.252	-0.236
	(1.71)	(1.52)	(1.18)	(1.12)
<b>Observations</b>	64	64	64	64
<b>R-squared</b>	0.21	0.19	0.19	0.20

The table presents the OLS regression results of estimating banks' risk-taking activities during the Global Financial Crisis. The dependent variable is Provision\_0708 in columns (1) and (2), and Private MBS\_0708 in columns (3) and (4). See Appendix 1 for variable definitions and measurements. T-statistics in parentheses are calculated using robust standard errors. \*\*\*, \*\*, and \* denote significance at 1%, 5%, and 10% levels (two-sided tests).

## Appendix 1: Variable Definitions

Variable names	Definitions and data source
<b><i>Financial Performance during or after the GFC</i></b>	
Ret_jul07_dec08	Buy-and-hold returns for the period July 2007-December 2008 [CRSP]
ROA_q307_q408	The sum of net income from the third quarter of 2007 to the fourth quarter of 2008 divided by the assets at the second quarter of 2007 [Compustat]
ROE_q307_q408	The sum of net income from the third quarter of 2007 to the fourth quarter of 2008 divided by the shareholders' equity at the second quarter of 2007 [Compustat]
Ret_2009	Buy-and-hold returns for the period January 2009-December 2009 [CRSP]
<b><i>Risk Taking during or after the GFC</i></b>	
IdioRisk_july07dec08	Standard deviation of daily stock return residuals from the market model for the period July 2007-December 2008 [CRSP]
Bondret_jul07_dec08	Bond returns for the period July 2007-December 2008 [Bloomberg]
VaR_0708_1pct	The average of one-day 99% value-at-risk for 2007 and 2008 [CRSP]
ES_0708_1pct	The average of expected shortfall for 2007 and 2008 [CRSP]
Provisions_0708	The average of provision of loan and lease losses divided by total assets for 2007 and 2008 [FR Y-9C]
Private MBS_0708	The average of fair value of private mortgage-backed securities on the balance sheet divided by total assets for 2007 and 2008, and is computed using the difference between total MBS and agency MBS [FR Y-9C]
IdioRisk_2009	Standard deviation of daily stock return residuals from the market model for the period January 2009-December 2009 [CRSP]
BondRet_2009	Bond returns for the period January 2009-December 2009 [Bloomberg]
<b><i>Bank Characteristics (measured as of fiscal year end unless noted otherwise)</i></b>	
Assets	Total assets in millions [Compustat, at]
Liabilities	Total liabilities in millions [Compustat, lt]
Market value	Market capitalization in millions [Compustat, prcc_f*csho]
Cash/Assets	Total cash divided by total assets [Compustat, che/at]

Variable names	Definitions and data source
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***Bank Characteristics, Continued***

Div. per share	Cash dividends per share [Compustat, dvpsx_f]
Book-to-market	Book value of total assets divided by the sum of market value of equity and book value of liabilities [Compustat, at/(prcc_f*csho+at-ceq)]
Tier 1 cap ratio	Risk-adjusted capital ratio – Tier 1 [Compustat Bank, capr1]
Liabilities / Market Value	total liabilities divided by market value [Compustat, liabilities/(prcc_f*csho)]
Liabilities / Assets	total liabilities divided by total assets [Compustat, liabilities/at]
Ret_2006	Buy-and-hold returns for the year 2006 [CRSP]
ROA_2006	Return on Assets for the year 2006 [Compustat]
Ret_2008	Buy-and-hold returns for the year 2008 [CRSP]
ROA_2008	Return on Assets for the year 2008 [Compustat]

***Bank CEO Annual Compensation (measured as of fiscal year end and in thousands of dollars)***

Total comp	Total compensation [Execucomp, tdc1]
Salary	Salary [Execucomp, salary]
Annual option awards FV	Fair value of stock option grants [Execucomp, option_awards_fv]
Annual stock awards FV	Fair value of stock awards [Execucomp, stock_awards_fv]

***Bank CEO Wealth Portfolio (measured at the end of fiscal year end and in thousands of dollars)***

Deferred comp value	Total aggregate balance in deferred compensation [Execucomp, defer_balance_total]
Pension value	Present value of accumulated pension benefits [Execucomp, pension_value_tot]
Inside debt	Deferred comp value + Pension value [Execucomp]
Option value	Value of all the option grants outstanding using the Black-Scholes option pricing model [Execucomp]
Stock value	Value of all the stock holdings, closing stock price times the number of shares held [Execucomp]

Variable names	Definitions and data source
<b>Bank CEO Wealth Portfolio, Continued</b>	
Restricted share value	Value of unvested restricted stock holdings [Execucomp, stock_unvest_val]
Total equity value	Option value + Stock value + Restricted share value
<b>Bank CEO Inside debt (measured at the end of fiscal year)</b>	
CEO debt-equity ratio	Inside debt / total equity holdings
Bank CEO relative incentive ratio	(CEO debt / bank total liabilities with overweighted insured deposits) / (change in CEO equity portfolio/change in bank equity portfolio)
<b>Bank CEO Personal characteristics</b>	
CEO age	Age [Execucomp and proxy statements]
Tenure as CEO	The number of years as the CEO of the bank [Execucomp and proxy statements]
<b>Bank CEO Pension details (collected from fiscal 2006 proxy statements)</b>	
Pre_Retire	Indicator variable equal to 1 if the observations corresponds to the years prior to CEO retirement, that is, the CEO is 55 years or older, and 0 otherwise [proxy statements]
Serp_Perf	Indicator variable equal to 1 if the pension plan is contingent on performance during the years prior to CEO retirement [proxy statements]
<b>Bond characteristics</b>	
Callable	Indicator variable equal to 1 if the bond is callable, and 0 otherwise [Bloomberg]
Bond rating	Equal to 1 if Bloomberg bond rating="CC+", 2 if "B", 3 if "BB-", 4 if "BB", 5 if "BB+", 6 if "BBB", 7 if "A-", 8 if "A", 9 if "A+", and 10 if "AA-" [Bloomberg]
Maturity	Bond maturity in number of years [Bloomberg]

## Appendix 2: List of Sample Banks

1	POPULAR INC	42	INDEPENDENT BANK CORP/MI
2	BANK OF HAWAII CORP	43	PROVIDENT BANKSHARES CORP
3	JPMORGAN CHASE & CO	44	OLD NATIONAL BANCORP
4	CITY NATIONAL CORP	45	SVB FINANCIAL GROUP
5	COMERICA INC	46	WEBSTER FINANCIAL CORP
6	COMMERCE BANCSHARES INC	47	CORUS BANKSHARES INC
7	CITIGROUP INC	48	FIRST FINL BANCORP INC/OH
8	COUNTRYWIDE FINANCIAL CORP	49	SUSQUEHANNA BANCSHARES INC
9	CULLEN/FROST BANKERS INC	50	TRUSTCO BANK CORP/NY
10	DOWNEY FINANCIAL CORP	51	UNITED BANKSHARES INC/WV
11	FIRSTMERIT CORP	52	SOUTH FINANCIAL GROUP INC
12	WACHOVIA CORP	53	FIRST COMMONWLTH FINL CP/PA
13	HUNTINGTON BANCSHARES	54	IRWIN FINANCIAL CORP
14	BANK OF AMERICA CORP	55	STERLING FINANCIAL CORP/WA
15	NORTHERN TRUST CORP	56	S & T BANCORP INC
16	WELLS FARGO & CO	57	CATHAY GENERAL BANCORP
17	PNC FINANCIAL SVCS GROUP INC	58	COLUMBIA BANKING SYSTEM INC
18	KEYCORP	59	ANCHOR BANCORP INC/WI
19	STATE STREET CORP	60	STERLING BANCSHRS/TX
20	STERLING BANCORP/NY	61	FIRST FINL BANKSHARES INC
21	UMB FINANCIAL CORP	62	BOSTON PRIVATE FINL HOLDINGS
22	WHITNEY HOLDING CORP	63	ASTORIA FINANCIAL CORP
23	WILMINGTON TRUST CORP	64	NEW YORK CMNTY BANCORP INC
24	ZIONS BANCORPORATION	65	CASCADE BANCORP
25	ASSOCIATED BANC-CORP	66	HANMI FINANCIAL CORP
26	BB&T CORP	67	DIME COMMUNITY BANCSHARES
27	FIRST MIDWEST BANCORP INC	68	WINTRUST FINANCIAL CORP
28	SYNOVUS FINANCIAL CORP	69	WILSHIRE BANCORP INC
29	INDYMAC BANCORP INC	70	FLAGSTAR BANCORP INC
30	FIRSTFED FINANCIAL CORP/CA	71	UNITED COMMUNITY BANKS INC
31	FULTON FINANCIAL CORP	72	UMPQUA HOLDINGS CORP
32	COLONIAL BANCGROUP	73	NARA BANCORP INC
33	BANCORPSOUTH INC	74	BROOKLINE BANCORP INC
34	WESTAMERICA BANCORPORATION	75	UCBH HOLDINGS INC
35	TCF FINANCIAL CORP	76	PROSPERITY BANCSHARES INC
36	WASHINGTON MUTUAL INC	77	EAST WEST BANCORP INC
37	BANKATLANTIC BANCORP -CL A	78	PRIVATEBANCORP INC
38	CENTRAL PACIFIC FINANCIAL CP	79	HUDSON CITY BANCORP INC
39	FIRST BANCORP P R	80	PACWEST BANCORP
40	GLACIER BANCORP INC	81	BANK MUTUAL CORP
41	FREMONT GENERAL CORP	82	FRANKLIN BANK CORP
		83	PEOPLE'S UNITED FINL INC

### Appendix 3: List of Excluded Banks

#### **BANKS WITH FISCAL YEAR END BEFORE DECEMBER**

BANKUNITED FINANCIAL CORP

WASHINGTON FED INC

#### **BANKS EXPERIENCING CEO TURNOVER OR ACQUISITIONS DURING 2006 AND 2007**

BANK OF NEW YORK MELLON CORP

UNIONBANCAL CORP

FIFTH THIRD BANCORP

REGIONS FINANCIAL CORP

M & T BANK CORP

U S BANCORP

FIRST HORIZON NATIONAL CORP

MARSHALL & ILSLEY CORP

NATIONAL CITY CORP

SUNTRUST BANKS INC

CENTER FINANCIAL CORP

COMMUNITY BANK SYSTEM INC

NATIONAL PENN BANCSHARES INC

SOVEREIGN BANCORP INC

TOMPKINS FINANCIAL CORP

FIRST NIAGARA FINANCIAL GRP

COMPASS BANCSHARES

MELLON FINANCIAL CORP

MERCANTILE BANKSHARES CORP

FIRST REPUBLIC BANK

CHITTENDEN CORP

FIRST INDIANA CORP

TD BANKNORTH INC

MAF BANCORP INC

INVESTORS FINANCIAL SVCS CP

GREATER BAY BANCORP

COMMERCE BANCORP INC/NJ

## Appendix 4: Summary Statistics of Banks and Bank CEOs Post-Financial Crisis

Panel A: Summary statistics of Banks

Variable	N	Q1	Median	Q3	Mean	Std. Dev
<b><u>Bank Characteristics</u></b>						
Assets	64	5256.170	11341.330	23087.090	107790.610	381840.890
Liabilities	64	4840.340	10221.720	21057.950	98411.050	349991.990
Market value	64	456.687	1114.580	2772.890	7196.310	22695.440
Cash/Assets	64	0.021	0.035	0.065	0.059	0.072
Div. per share	64	0.325	0.659	1.145	0.794	0.613
Book-to-market	64	0.950	0.988	1.029	0.981	0.056
Tier 1 cap ratio	64	0.093	0.109	0.121	0.107	0.030
Liabilities / Assets	64	0.883	0.901	0.925	0.902	0.037
ROA_2008	64	-0.008	0.005	0.009	-0.004	0.020
Ret_2008	64	-0.468	-0.166	0.039	-0.217	0.358
<b><u>Bank Performance post GFC</u></b>						
Ret_2009	64	-0.487	-0.133	0.027	-0.209	0.376
<b><u>Bank Risk-taking post GFC</u></b>						
IdioRisk_2009	63	0.418	0.519	0.831	0.708	0.488
BondRet_2009	124	0.075	0.105	0.168	0.127	0.143

The panel presents summary statistics of sample banks measured at the end of 2008 except for post-Crisis performance and risk measures. See Appendix 1 for variable definitions and measurements.

Panel B: Summary statistics of Bank CEOs

Variable	N	Q1	Median	Q3	Mean	Std. Dev
<b><u>CEO Annual Compensation</u></b>						
Total Comp	64	923.32	1558.88	3140.26	3081.18	4989.50
Salary	64	525.77	746.15	910.25	731.14	268.68
Annual option awards FV	64	0.00	138.99	832.79	1004.82	2765.36
Annual stock awards FV	64	0.00	0.00	600.87	845.24	2312.21
<b><u>CEO Wealth Portfolio</u></b>						
Deferred comp value	64	0.00	342.40	921.45	1150.30	2039.58
Pension value	64	0.00	1270.98	5399.82	4367.47	8372.39
Inside debt	64	433.75	2013.24	7253.20	5517.78	9779.92
Option value	64	1.08	171.73	1390.44	1287.72	2431.18
Stock value	64	6304.10	14694.14	32377.37	36480.44	58664.64
Restricted share value	64	0.00	159.08	936.67	1338.81	3488.96
Total equity value	64	6874.64	14915.37	38332.61	39106.97	62072.33
<b><u>CEO Inside Debt</u></b>						
CEO debt-equity ratio	64	0.03	0.14	0.36	0.39	1.18
CEO relative incentive ratio	63	0.01	0.08	0.15	0.14	0.20
Bank CEO relative incentive ratio						
<b><u>CEO Personal Characteristics</u></b>						
CEO age	64	53.50	59.00	62.00	58.23	7.28
Tenure as CEO	64	4.00	8.00	16.00	10.27	7.97

The table presents summary statistics for CEOs of sample banks measured at the end of 2008. See Appendix 1 for variable definitions and measurements.

## **Appendix 5: CEOs' Inside Debt and Bank Risk-Taking & Performance Post-Financial Crisis**

[To come.]

## **Appendix 6: Addressing Performance Incentives in Pension and Deferred Compensation Arrangements**

Some pension and deferred compensation arrangements for our sample banks offer equity-like pay-for-performance features, so that pensions and deferred compensation for CEOs of these banks are not simply fixed claims against the firm. In this Appendix, we explain these performance features and our approach for addressing them in our tests. Because these performance features have no significant effect on the quality of our results, we omit tabulating the results.<sup>32</sup>

First, some deferred compensation plans allow executives to invest their deferred compensation in company stock.<sup>33</sup> Notwithstanding the potentially long time horizon involved, this stock investment alternative may create something of a traditional performance incentive effect, muddying the pure debt-like incentive of traditional fixed deferred compensation. We address this issue in two ways. First, we run tests controlling for this with a dummy variable which is set to one for the 28 CEO-banks with a stock investment option for deferred compensation, and set to zero otherwise. Second, we run tests setting the deferred compensation component to be zero for these 28 banks.<sup>34</sup>

Pension plans may also have performance components. Some CEOs enjoy Supplemental Executive Retirement Plans (SERPs) under which the pension benefit is calculated as a function

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<sup>32</sup> These results are available upon request.

<sup>33</sup> The investment options under deferred compensation plans generally include 401(k)-type investment plans, mutual funds, or simply accruals of interests. Our review of proxy statements for our sample banks shows that out of the 83 banks, 28 allow senior executives to invest deferred compensation in their bank's stock. In these 28 banks, the CEO's deferred compensation balance is greater than zero, so we cannot rule out the possibility that this form of inside debt does not offer clear debt incentives for the CEO. Besides these 28 banks, (a) 27 have plans that do not offer senior executives the option to invest in company stock, and (b) 27 banks either do not offer deferred compensation plans or their CEOs have a zero balance.

<sup>34</sup> Ideally we would exclude only the amounts invested in the bank's stock from the CEO's deferred compensation balance. However, this information is not available from proxy statements because companies are not required to disclose the investment details of their CEOs' deferred compensation balances.

of firm performance in the CEO's final pre-retirement years.<sup>35</sup> This feature is likely to influence firm policy during the CEO's final years. For example, Kalyta (2008, 2009) finds evidence of income-increasing earnings management and less risk taking in the pre-retirement period when the CEO's SERP is contingent on performance. If bank CEOs in our sample have performance contingent SERPs and are close to retirement age, the incentive effects may be ambiguous.

Following Kalyta (2008, 2009), we define an indicator variable *Serp\_Perf* to equal one for the 27 banks that offer performance-contingent SERPs, and zero for the other 55 banks. We also define an indicator variable *Pre\_Retire* to equal one for CEOs who are in their pre-retirement years, and zero otherwise. Given a traditional retirement age of 65, we define CEOs 55 years or older as being in their pre-retirement years.<sup>36</sup> To control for the pay-for-performance impact of performance contingent SERPs during the CEOs' pre-retirement years, we include *Serp\_Perf*, *Pre\_Retire*, and an interaction term in our empirical analyses (Kalyta, 2008, 2009).

As noted above, these alternative tests for SERPs and deferred compensation plans showed no significant effect on the quality of our results.

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<sup>35</sup> While the formula for determining pension amounts varies across banks, two typical approaches are to use the highest five consecutive years' compensation out of the last ten pre-retirement years, or to use the highest three consecutive years out of the last five. SERPs not contingent on performance include cash-balance SERPs, fixed payment SERPs, and traditional SERPs based on salary during the final pre-retirement years. Proxy statements reveal that 27 banks in our sample offer performance contingent SERPs. CEOs' pension balances at these 27 banks are greater than zero, so again, we cannot rule out a tainting effect of the SERP performance incentives. Pension amounts are calculated as a percentage of the CEO's total compensation in pre-retirement years, which total compensation includes performance-based incentive compensation. Besides these 27 banks, (a) 31 banks do not have SERPs or the CEO has a zero pension balance, and (b) 24 banks offer SERPs that are not contingent on performance.

<sup>36</sup> We repeat our empirical analyses by defining pre-retirement years as 60 years or older and find qualitatively similar results.