Managerial Myopia and the Mortgage Meltdown

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Abstract

Regulators and policy makers, including the U.S. government's Financial Crisis Inquiry Commission, have frequently asserted that managerial short-termism was at the root of the subprime mortgage crisis of 2007-2009. Scholarly work investigating the matter, however, has largely failed to find evidence of this assertion. In contrast, we find that financial firms whose CEOs had shorter equity award vesting schedules, as measured pre-crisis, were more exposed to subprime residential mortgages during the crisis than were financial firms whose CEOs had longer vesting schedules. Further, shorter vesting schedules are associated with poorer stock returns and higher probability of insolvency during the crisis. Finally, we find that shorter vesting schedules are associated with larger fines and settlements in lawsuits and enforcement actions related to subprime mortgage fraud or misrepresentation. We conclude that CEO short-termism played a role in the crisis.

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Introduction

This study empirically examines whether CEO short-termism played a role in the subprime mortgage crisis of 2007-2009. Some prominent policy makers are convinced that incentives for short-termism were a major contributor to the crisis. For example, the US government's Financial Crisis Inquiry Commission asserts the following:

> Compensation systems…too often rewarded the quick deal, the short-term gain–without proper consideration of long-term consequences…This was the case up and down the line–from the corporate boardroom to the mortgage broker.[1]

The academic literature, however, mostly disputes the above. Fahlenbrach and Stulz (2011) fail to find evidence that CEO incentives for short-termism impacted bank performance during the crisis, while Erel, Nadauld, and Stulz (2014) conclude CEO incentives were unrelated to bank holdings of "toxic" mortgage-backed securities. In contrast, by employing more powerful tests, we uncover evidence that the Financial Crisis Inquiry Commission is correct. Namely, we find that a financial institution's exposure to subprime credit risk during the crisis is associated with the short-termism implied by the vesting schedule of CEO stock and option holdings just prior to crisis. We also find that short-term incentives are associated with poor abnormal stock performance and a higher probability of insolvency during the crisis. Finally, we find that short-term incentives are associated with larger legal settlements and fines for fraud or misrepresentation related to the subprime crisis.

The tests we employ are more powerful than those in prior research primarily because we use a more comprehensive measure of short-termism in CEO incentives. Fahlenbrach and Stulz (2011), Erel, Nadauld, and Stulz (2014), and others use the ratio of cash bonus to base salary. Consistent with these studies, we find this measure of short-termism is unre-

[1]The Financial Crisis Inquiry Report (2011), p. ix.

lated to firm risk-taking, fraud liability or in-crisis performance. However, as Fahlenbrach and Stulz (2011) aknowledge, the cash bonus is usually small, so its incentive effects are likely small. For the majority of firms in our sample, the bonus is less than 21% of total pay and less than 2% of total CEO holdings. We therefore employ an alternative measure of short termism similar to the equity duration measure of Gopalan, Milbourn, Song, and Thakor (2014), the weighted-average length of time a CEO must wait before she is contractually allowed to cash out of all her outstanding stock and option awards. Since our measure considers the timing of the CEO's ability to cash out on the totality of his awards, and not just the small fraction consisting of the cash bonus, it more comprehensively captures the short term nature of the CEO's incentives, and hence gives us greater statistical power. We also consider the normalized ratio of the CEO's debt-like holdings to CEO equity and option holdings (henceforth the "inside debt ratio") , as in Wei and Yermack (2011), as well as the Macaulay duration of the CEO's inside debt, as in Anantharaman, Fang, and Gong (2013).

We find that longer CEO equity duration, as measured just prior to the crisis (as all our incentive measures), is related to lower subprime exposure, higher Fama-French alphas and lower probability of distressed delisting during the crisis. Longer CEO equity duration is also related to lower legal settlements and fines for subprime-related fraud or misrepresentation. In contrast, the Macaulay duration of CEO inside debt has no effect on any of the variables we examine. The CEO inside debt ratio has only limited effects: it is associated with lower fraud payouts and lower tail risk and probability of insolvency during the crisis, but we cannot detect an effect on subprime exposure or alphas during the crisis.

We note that by focusing on the link between CEO incentives and subprime exposure and related fraud liability, we can draw normative conclusions past studies cannot. Past studies on managerial incentives and the crisis, discussed in greater depth below, largely focus on how CEO incentives are related to firm survival or performance during the crisis.

This evidence does not necessarily imply that incentives are associated with suboptimal managerial behavior. It does suggest that some incentives are related to managers exposing their shareholders to greater systematic risk, but if this risk was appropriately compensated based on information known ex ante, such exposure could have been optimal. Ex-post performance during a rare event, such as a financial crisis, is not necessarily indicative of ex-ante return expectations. In contrast, we show that incentives for short termism are related to greater exposure to subprime credit risk, which prior literature has shown to be mispriced ex-ante (e.g., Piskorski, Seru, and Witkin 2015) due to fraud, of which top managers were aware. We also show the same incentives are associated with CEOs allowing their firms to become complicit in subprime-related fraud. We submit that it is very difficult, if not impossible, to reconcile such behavior with a CEO's fiduciary duty. Hence we can conclude that the CEO incentives we study are associated with suboptimal behavior.

Given that the duration of CEO incentives is endogenous, it would be ideal to employ a quasi-natural experiment approach to help establish causality. Unfortunately, though, like all other extant studies of CEO incentives and the financial crisis, we cannot rely on such an approach. Thus, one potential concern about our work is the possibility of reverse causality: CEOs eager to cash in on high fees from the underwriting and securitizing of fraud-laden subprime mortgages might have influenced boards to give them short vesting schedules in order to make it easier to cash out early. However, even if such reverse causality drives our results, it would still imply that short vesting schedules were a key element in the strategy of increasing firm exposure to subprime assets.

Another potential concern is omitted variable bias. Despite our attempts to control for a number of firm, board and governance characteristics, we cannot completely rule out the possibility that some omitted characteristic caused boards to allow CEOs to expose their firms to subprime assets, and simultaneously caused boards to give CEOs shorter vesting schedules. It seems necessary, however, that such a characteristic would be a manifestation

of short-termism at the board. For instance, a board fixated on short-term performance will give CEOs shorter vesting schedules, while at the same time it is less vigilant in monitoring uncompensated risk exposures. As with the reverse causality concern, though, short term incentives would still be a key element in the strategy. It is therefore difficult to envision a sensible economic story in which a CEO with long-term incentives would increase bank exposure to overvalued subprime assets and related fraud liability when she knows that in the long-term her payoffs would likely be low or negative. Thus, although we cannot entirely rule out endogeneity concerns, we can safely conclude that short term incentives played a role in financial firms' decisions about exposure to subprime assets and complicity in subprime-related fraud.

Finally, we note this study helps resolve a puzzle related to the crisis. There is substantial evidence of widespread fraudulent misrepresentation of credit-relevant factors in the underwriting of a large fraction of the subprime mortgages whose default precipitated the crisis.[2] Piskorski, Seru, and Witkin (2015) find that in the years leading up to the crisis, subprime mortgage-backed securities markets failed to price the high ex-ante default risk hidden from investors by fraud. However, there is also substantial evidence, discussed below, that the top managers of some financial institutions were aware of widespread underwriting fraud in the years leading up to the crisis. Nevertheless, the institutions they managed originated hundreds of billions of dollars in overpriced mortgages and securities backed by them that they knew, or should have known, did not meet underwriting standards represented to investors, thereby exposing their firms to large legal liabilities. Worse, these managers also allowed their institutions to take large positions in these very same mortgages and securities they knew, or should have known, were overvalued due to fraud. Given that these CEOs were also shareholders in their own firms, it is quite puzzling that they allowed their firms to take on such large overvalued positions, as well as such exposure

[2]Pendley, Costello, and Kelsch (2007), Garmaise (2015), Jiang, Nelson, and Vytlacil (2014), and Piskorski, Seru, and Witkin (2015).

to large legal liabilities.

Our results provide empirical evidence that theories of managerial myopia, such as Stein (1989), can resolve this puzzle. Such theories assert that if managers have an incentive to boost the stock price in the near term, they will sometimes take actions that boost short-term cash flows but destroy shareholder value in the long run, even if they hold equity in the firm. Short equity award vesting schedules (and possibly correlated informal incentives) provided the incentive to boost the short-term stock price at the expense of long term value. High fees earned from originating and securitizing overvalued subprime mortgages, activities that also required the firm to retain significant subprime exposure,[3] provided the means and opportunity. By showing our proxy for short-termism is associated with firm exposure to subprime, as well as complicity in subprime-related fraud, we provide evidence that theories of managerial myopia can explain some of the puzzling behavior of financial institutions that led to the crisis.

The rest of this study is organized as follows. Section I discusses the academic literature on the relation between CEO incentives and the crisis. Section II reviews the evidence that there was widespread fraud in the underwriting and securitization of subprime mortgages. It also discusses evidence that top managers of financial institutions were aware of it. Section III discusses data sources and methods. Section IV presents results. Section V concludes.

[3]Erel, Nadauld, and Stulz (2014) find that banks with securitization programs tended to have the largest exposures to private-label mortgage-backed securities during the crisis.

I. Literature related to CEO Incentives and the Subprime Crisis

Even though ours is the first study to link financial firm subprime exposure to short-termism, it is not the first to examine the role of other CEO incentives in in the crisis. Van Bekkum (2015), Bennett, Güntay, and Unal (2015) and Tung and Wang (2012) find that a high ratio of CEO inside debt to equity, relative to the ratio of outside debt to equity, led banks to take fewer risks and perform better during the crisis. Consistent with these studies, we find that inside debt is correlated with less tail risk, a lower probability of distressed delisting, and lower fraud liability. Inconsistent with these prior papers, however, we fail to find any relation between inside debt and stock performance during the crisis. We suspect our findings on stock performance differ because we control for many variables the other papers do not, such as institutional holdings.

Cerasi and Oliviero (2014), DeYoung, Peng, and Yan (2013) and Boyallian and Ruiz-Verdú (2015) find that the sensitivity of CEO equity and option holdings to stock volatility (i.e. the CEO's vega) had an impact on bank risk taking. Inconsistent with these papers, we fail to find any connection between CEO option vega and any of our measures of firm risk, including subprime exposure, tail risk or probability of distressed delisting. Again, we suspect our results differ because we control for more variables.

We further note that, unlike ours, the above studies focus on how incentives are related to in-crisis bank performance and ignore the question of how incentives are related to subprime exposure and subprime fraud. While the evidence in these prior studies implies that incentives led CEOs to expose banks to more systematic risk, such behavior is not necessarily suboptimal, as greater systematic risk might have been appropriately compensated ex-ante. In contrast, by linking CEO incentives to exposure to an asset class that was ex-ante overvalued due to fraud, our study has stronger normative implications.

Whereas we successfully find a relation between short-termism and subprime exposure, Fahlenbrach and Stulz (2011) and Erel, Nadauld, and Stulz (2014) also investigate related questions and fail to find that short-termism has any effect. The difference lies in the proxy for short-termism. The aforementioned studies use the ratio of CEO cash bonus to salary, whereas our measure is based on the average time to vesting of all the CEO's stock and option holdings. Cash bonuses are a small component of CEO pay and wealth, so their incentive effects are unlikely to be large. In contrast, holdings of equity in the firm constitute a large fraction of CEO wealth, so our more comprehensive proxy for short-termism gives our tests more statistical power.

Livne, Markarian, and Mironov (2013) and Cools and Van Toor (2015) have findings that are not entirely consistent with some of the above studies that investigate short-termism. Livne, Markarian, and Mironov (2013) find that banks with a high ratio of CEO bonus to salary tend to make shorter-term investments and perform poorly during crises. Cools and Van Toor (2015) find that high pre-crisis cash bonuses are associated with a lower probability of bank survival during the crisis. While these studies have interesting findings, like other studies on CEO incentives, they only link incentives to bank performance during the crisis, which is not necessarily indicative of suboptimal CEO behavior for reasons stated above. In contrast, by showing CEO incentives led to increased exposure to assets known to be overvalued ex-ante, our study has stronger normative implications.

Another point of contrast between our study and most others mentioned above is that the latter limit their analysis to bank holding companies, whereas we also consider securities broker-dealers, mortgage companies and other non-bank financial firms involved in the business of originating mortgages, mortgage-backed securities, and other fixed income securities. Since many non-bank financial firms, such as Countrywide and Lehman Brothers, played an important role in the housing boom and subsequent subprime mortgage crisis of the 2000's, it is important to consider them in any analysis of the crisis.

Several studies examine pre-crisis insider trading at financial firms, and the findings are mixed. Bhagat and Bolton (2014) find that the CEOs of the 14 largest financial firms cashed out more in net insider share sales over 2000-2008 than they subsequently lost on the shares they continued to hold. Bebchuk, Cohen, and Spamann (2010) come to a similar conclusion in case studies of Lehman Brothers and Bear Sterns. In contrast, Adebambo, Brockman, and Yan (2015) find that financial firm insiders were, in the aggregate, net buyers of their own stock just prior to the crisis, whereas non-financial firm insiders were net sellers. Fahlenbrach and Stulz (2011) graph aggregate CEO insider trading for their sample and find no obvious patterns. Cziraki (2015) finds CEOs of banks more exposed to real estate sold more shares right after the housing market peak in 2006 relative to CEOs of less exposed banks. While of the above findings are important, the matter that they address, pre-crisis financial firm CEO insider trading, is distinct from the matter of financial firm CEO short-termism, upon which we focus, though we do control for CEO sales in the years leading up to the crisis.

In a study related to ours, Bhattacharyya and Purnanandam (2011) find that the share of non-performing loans in bank portfolios in 2007 is correlated with bank CEO total pay-to-EPS sensitivity estimated over 2000-2006. Pay-to-EPS sensitivity could potentially induce short-termism in CEO incentives, so the study does provide some suggestive evidence about short-term incentives. However, as with most other studies, it only examines the relation between its measure of CEO incentives and ex-post crisis performance, so it cannot draw the same normative conclusions as can we for reasons stated above.

A large number of studies have conflicting findings on how corporate governance is related to bank performance during the crisis. The camp claiming that good governance made financial firms perform worse in the crisis includes Beltratti and Stulz (2012), who find that commercial banks with more shareholder-friendly boards and located in more shareholder-friendly countries performed worse during the crisis. Erkens, Hung, and Matos (2012) find

that the performance of financial firms around the world during the crisis was negatively correlated with board independence and institutional holdings. Along similar lines, Cools and Van Toor (2015) find that standard measures of good corporate governance are negatively correlated with the probability of bank survival during the crisis. Providing more evidence along these lines, Minton, Taillard, and Williamson (2014) find that banks whose boards had more financial expertise took more risk pre-crisis and performed worse during the crisis. In the other camp, Brown, Jha, and Pacharn (2015) find that firms that granted more generous CEO severance packages (an indication of poor governance) took more risk prior to the crisis. Ellul and Yerramilli (2013) and Aebi, Sabato, and Schmid (2012) find that the quality of risk management controls at banks is associated with better performance during the crisis. Along the same lines, Saghi-Zedek and Tarazi (2014) find that European banks with stronger shareholder rights performed better during the crisis and recovered faster, even though they performed worse before the crisis. Coming to a more nuanced conclusion, Mamatzakis and Bermpei (2015) find that investment banks with big boards, an indication of poor governance, performed more poorly during the crisis. However, investment banks with more CEO power, conventionally considered to be an indication of poor governance, performed better. Peni and Vahamaa (2012) find that banks scoring high in governance performed more poorly during the crisis, but then recovered more quickly.

Finally, we note several studies that link managerial beliefs to the crisis. Ma (2014) and Ho, Huang, Lin, and Yen (2015) find that banks with more optimistic CEOs were more exposed to the subprime crisis. Cheng, Raina, and Xiong (2014) find that mortgage securitization professionals themselves invested heavily in real estate, suggesting they did not believe that potential losses in subprime, if any, were likely to result in a bear market in housing. We note that our findings are not inconsistent with the above, as it is plausible that both optimism and short-termism drove subprime exposure. In all of our specifications, our inclusion as an independent variable of CEO shares sold in the pre-crisis years (normalized

by total CEO shares held) should help control for CEO optimism. Ahmed, Christensen, Olson, and Yust (2015) find that banks whose CEOs and directors who had experienced the Savings and Loan crisis of the 1980's performed better during the subprime crisis, suggesting that managerial experience in steering a bank through a past financial crisis can be beneficial.

II. Fraud and the Subprime Crisis

Many academic and industry studies demonstrate that a large fraction of subprime mortgages prior to the crisis were underwritten with fraudulent information, and this fraud drove a large share of the delinquencies that initiated the crisis. Garmaise (2015) finds that a large fraction of residential mortgage applications fraudulently overstated assets, and borrowers engaging in such fraud had twice the delinquency rates of honest ones. Jiang, Nelson, and Vytlacil (2014) find that broker-originated mortgages were particularly prone to income fraud, as they relied on low documentation. They further find that at least half the difference in delinquency rates between broker and bank-originated mortgages not attributable to verifiable borrower characteristics can be attributed to the higher propensity of fraud in reported income for broker-originated mortgages. Among many industry reports too numerous to mention all here, a 2007 Fitch report declares that fraud was a major cause of defaults in subprime residential mortgages at the beginning of the crisis (e.g., Pendley, Costello, and Kelsch 2007). A representative of Interthinx, a fraud detection service, testified under oath before the US Congress that her analysis implied the fraction of subprime mortgages underwritten between 2005-2007 tainted with at least some minor fraud could have been as high as 60%.[4]

[4]Financial Crisis Inquiry Report, p. 160.

Piskorski, Seru, and Witkin (2015) provide damning evidence of misrepresentation of borrower loan-to-value ratios (LTVs) in the origination of subprime mortgage-backed securities. They find that 16.64% of loans securitized in non-agency mortgage-backed securities were misrepresented to buyers as being free of a second lien, when in fact the borrowers also had second mortgages or home equity lines of credit outstanding. As a result, these mortgages, on average, had LTVs 20 percentage points higher than what was represented to investors. Moreover, internal firm data shows the originators of the mortgage-backed securities had the correct information on LTVs that they misrepresented, demonstrating intentional deception. Further evidence demonstrates that such deception caused overpricing. While the default rates on the misrepresented loans were similar to that of honest loans with similar true borrower characteristics, securities backed by misrepresented loans were priced significantly higher than those backed by honest loans. Furthermore, given the Interthinx estimate of the extremely high prevalence of fraud within subprime mortgages cited above, it is likely that the misrepresentations uncovered by Piskorski, Seru, and Witkin (2015) are just the tip of the iceberg. The totality of the evidence thus strongly suggests that subprime mortgages and mortgage-backed securities were overvalued as an asset class because widespread fraud and misrepresentation was hiding from investors negative credit-relevant information.

There is strong evidence from lawsuits, Congressional investigations, and under-oath whistleblower testimony that many financial CEOs were aware their firms were complicit in widespread fraud in subprime markets and did nothing. For example, the CEO and other executives of Washington Mutual were informed by an internal investigation in 2005 that as many as 83% of subprime mortgages coming out of the firm's highest volume origination offices were tainted by fraud.[5] As individuals, they subsequently settled a $64 million suit brought by the Federal Depository Insurance Corporation for knowingly ignoring

[5]http://www.nbcnews.com/id/36440421/ns/business-real_estate/t/investigation-finds-fraud-wamu-lending/, accessed 11/16/2015.

such fraud.[6] The Goldman Sachs Firmwide Risk Committee, which includes the CEO, was warned on March 12, 2006 of a coming "meltdown" at major subprime lenders and that subprime credit was overvalued due to negative information being hidden from investors.[7] A year later, a Goldman Powerpoint presentation to the board of directors indicates top management had been aware of large-scale underwriting fraud by mid 2006 and had responded by directing the company to decrease subprime exposure.[8] Other top managers behaved less prudently in the face of such information. Citigroup senior managers ignored repeated warnings from the firm's mortgage underwriting chief that the firm was systematically misrepresenting to buyers of the mortgage-backed securities it was originating the underwriting standards of the underlying mortgages. They also ignored the chief's warnings that the firm was exposing shareholders to large uncompensated systematic risk through such activities.[9] Piskorski, Seru, and Witkin (2015) point out that J.P. Morgan admitted, as part of its settlement with the Justice Department, that senior management did nothing after it had been repeatedly warned by mid-level employees that the firm was routinely misrepresenting to investors credit-relevant information about the subprime mortgage-backed securities it was originating.

The above is just a small sampling of a large body of evidence that is far too massive for us to comprehensively review here, a task we leave to legal scholars. Our purpose is simply to demonstrate the credibility of the proposition that many CEOs knew or should have known their firms were intentionally misleading the buyers of the mortgages or mortgage-backed securities they were originating, as well as negligently exposing their firms to credit risk mispriced due to fraud.

[6] "WaMu insurance pays disgraced former directors' fines." Banking Newslink, December 16, 2011.

[7] U.S. Senate Permanent Subcommittee on Investigations, Hearing on Wall Street and the Financial Crisis: The Role of Investment Banks (April 27, 2010), Exhibit 19

[8] Ibid., Exhibit 22, slide 8

[9] The Financial Crisis Inquiry Report (2011), p. 168. See also Cohan (2013).

III. Sample Selection, Data and Descriptive Statistics

In this section we discuss our sample selection procedure (subsection A). We then discuss variables that we compute from data hand-collected from firm proxy statements (subsection B), followed by our subprime exposure measures (subsection C), our data on legal settlements (subsection D), and finally other control variables (subsection E). Lastly, we present and discuss descriptive statistics (subsection F).

A. Sample Section

We begin with the sample of all financial firms with available Compustat data that were in the Russell 3000 as of the end of 2006 and whose 2006 fiscal year ended between December of 2006 and May of 2007, inclusive. We exclude firms with fiscal year ends between June and November of 2006 because they only became subject to the requirement to disclose the information we need to compute duration measures in fiscal 2007, after the crisis had begun. We require firms to belong to the Russell 3000 in order to ensure that all firms in our sample were significant players in their market. Since the Russell 3000 accounts for approximately 98% of the investable U.S. equity market, our size screen causes us to include all but the tiniest financial institutions traded in the US.

We further limit the sample to firms whose business either involved the origination of residential mortgages, residential mortgaged-backed securities or some other closely-related activity. We do not require explicit participation in the business of origination of mortgages or mortgage-backed securities because we do not wish to exclude firms that had the capacity to participate but chose not to. To that end, we include all firms with Standard and Poor's historical Global Industrial Classification System (GICS) codes beginning with 4010, which include all commercial banks, thrifts and non-bank mortgage companies. In addition, we manually examine the business descriptions presented in the fiscal 2006

10-K of all firms whose 2006 historical subindustry GICs codes belong to one of the following: Asset Management & Custody Banks (40203010), Investment Banking and Brokerage (40203020), Diversified Capital Markets (40203030), Multi-Sector Holdings (40201030), or Other Diversified Financial Services (40201020). We include firms within the aforementioned groups of GICs codes if the business description indicates material activity in the origination of mortgages, mortgage backed securities or any other type of fixed income securities. Among firms excluded from our manual cull are the four major custodial banks (State Street, Bank of New York, Mellon Bank and Northern Trust), as well as pure-play securities brokers and dealers, mutual fund families, money managers, equity research firms, private equity companies and other companies that invest in debt and equity of other companies but do no debt origination. We also exclude the government-sponsored entities Fannie Mae, Freddie Mac and Farmer Mac. Once all of the above sample selection criteria are applied, our sample consists of 254 firms.

By construction, our business model screen described above excludes all financial firms classified as insurance (GICS beginning with 4030), Real Estate Investment Trusts (REITs) and Real Estate Management & Development (GICS beginning with 4040), Consumer Finance (40202010) and Specialized Finance (40201040). We exclude insurance companies because, though some were heavily exposed to subprime credit risk, most were not, and we see no way of identifying which had the capacity to engage in the business and which did not. We exclude REITs because of their unique governance structure, while real estate management and development is very different from mortgage origination. We manually examine all firms classified under Consumer Finance or Specialized Finance and confirm none was involved in the origination of mortgages, mortgage backed securities or other fixed income securities.

B. Proxy Statement Data

All the data discussed in this section is taken from each firm's proxy statement for fiscal 2006. If the firm has a fiscal year-end within the first half of 2007 (before June), we follow the Compustat convention and label that fiscal year as 2006. From the proxy we first obtain the CEO's age, sex, cash salary and total pay. We also obtain the CEO's equity ownership in the firm, measured using CEO's total disclosed beneficial ownership that excludes options that are exercisable or will become exercisable within 60 days, normalized by total shares outstanding. We now discuss how we use proxy data to compute the CEO's equity duration, inside debt ratio and debt duration.

1. Equity Duration and Other Equity-related Variables

We hand collect the time to vesting for each restricted stock and option grant held by the CEO as of the end of fiscal 2006. For restricted stock whose time to vesting depends on firm performance, we follow Gopalan, Milbourn, Song, and Thakor (2014) and assume that these grants become all vested at the end of the performance measurement period as disclosed by the firm. For restricted stock whose time to vesting is fixed, but the number of shares depends on firm performance, we use the target number of shares to be granted as disclosed by the firm.

To compute the CEO's total unrestricted stock holdings, we take the CEO's total beneficial holdings and subtract all restricted stock holdings and option holdings counted as part of beneficial holdings. Time to vesting of all vested options and unrestricted stock holdings is set to zero. We then compute the Black-Scholes value of all the CEO's options using as inputs the strike price, time to expiration, the stock price as of the end of the fiscal year, our estimates of stock volatility and dividend yield, and risk-free rate corresponding to the

maturity of the options as of fiscal year end.[10] The calculations of stock volatility and dividend yield closely follow Coles, Daniel, and Naveen (2013). We also use the Black-Scholes model to compute the dollar delta of each option holding, defined as the dollar change in the value of each option for each 1% change in the stock price. The dollar delta of each share of restricted and unrestricted stock holdings is just 1% of the stock price, and the value of each share of restricted stock is assumed to be equal to the fiscal year-end stock price. Finally, we compute the weighted average time to vesting for all stock and options holdings.

We use two alternative weighting schemes to compute the weighted average time to vesting. In the first alternative, we weight by the dollar value of the options or shares, and in the second, we weight by the dollar delta.

We also compute two control variables from the CEO's equity portfolio: the total dollar delta, as well as the dollar vega, defined as the sensitivity of the dollar value of the portfolio to a percentage point change in annualized stock volatility. We use the Black-Scholes model to compute the dollar vega.

Finally, for replication purposes, we follow Fahlenbrach and Stulz (2011) and compute the CEO's total cash bonus as the sum of the discretionary bonus, non-equity incentive plan cash payouts, and all other cash pay not part of base salary. We then compute ratios of the total bonus to base salary, total compensation and the total dollar value of CEO holdings in the firm (equity, options and inside debt). In untabulated results, we confirm the findings of Fahlenbrach and Stulz (2011) and fail to find that the bonus to salary ratio is related to poorer in-crisis performance or increased risk of insolvency.

[10]The risk-free rate is the annual series of treasury constant maturities, obtained from the Federal Reserve website: http://www.federalreserve.gov/releases/h15/data.htm#fn11

2. Inside Debt and Debt Duration

We also use the proxy statement to obtain data on the CEOs' total pay, as well as data on CEO inside debt. Following Wei and Yermack (2011) we define inside debt as the present value of the CEO's pension and non-qualified deferred compensation (NQDC), as disclosed in the proxy. We then compute the ratio of the value of the CEO's inside debt to the value of the CEO's option and stock holdings. Finally, to measure the relative importance of the CEO's debt incentives to equity incentives, we divide this ratio of inside debt to equity by the analogous ratio for the firm, the latter being obtained from Compustat as of the end of fiscal 2006. Since the inside debt ratio is highly skewed, we winsorize it at the 5 and 95 percentiles.[11]

We then compute the Macaulay duration of the CEO's inside debt using the same assumptions as Anantharaman, Fang, and Gong (2013). Specifically, we assume the CEO retires at the earliest age possible without receiving a benefit penalty. If the earliest penalty-free retirement age is not disclosed, we assume it is 65. We assume any NQDC is paid in full one year after the CEO retires. If the pension has a lump-sum option, we assume a single payout one year after retirement; otherwise, we assume the pension pays a constant annual dollar amount once per year, beginning one year after retirement and continuing for the number of years the firm indicates the pension will make payouts. If the firm does not disclose the number of pension payout years, we assume the last payout in the year of the CEO's expected death. We assumes the CEO's remaining life expectancy is the same as for the average person of the same age and sex in 2006, reported by the US Centers for Disease Control (the proxy statement provides information on the CEO's age and sex). Using the firm's disclosed pension discount rate and setting the present value of expected pension and NQDC cash flows equal to their firm-reported present values, we compute the

[11] Winsorization at 1 and 99 percentiles still leaves large skewness and kurtosis, but none of our results changes if we use these percentiles.

expected value of each assumed future pension and NQDC cash flow using the annuity formula. Finally, we compute the Macaulay duration of both the pension and NQDC using the standard formula and take the value-weighted average of the two to obtain our final measure of inside debt duration.

C. Subprime Exposure

In contrast to much of the prior literature, we measure each firm's exposure to the subprime mortgage meltdown with the sensitivity of the firm's stock return to changes in the yield spreads of the ABX indices of subprime residential mortgage-backed securities during the crisis. Prior literature uses measures such as the total pre-crisis holdings of private-label residential mortgage-backed securities, as well as loan charge-offs during the crisis. One problem with these measures is that they are only available for bank holding companies, whereas not all firms involved in the mortgage business were banks. Another problem with using holdings of private-label mortgage-backed securities as a measure of subprime exposure is that not all private-label mortgage-backed securities were subprime. Finally, loan charge-offs are distinct from losses on subprime mortgage-backed securities. In addition, loan charge-offs can be problematic because managers have some discretion as to when to recognize them, and they are also contaminated by accounting fraud and accounting rule changes. We therefore believe that a direct market-based measure of subprime exposure, such as ours, is superior.[12] Nevertheless, for completeness, we run additional specifications utilizing these accounting-based measures.

The procedure to compute our measures is as follows. First, we compute from CRSP daily data the weekly stock returns (inclusive of dividends) for each firm starting from the first week of July of 2007 to the last week of March of 2009, a date range that has been used to define the crisis period in prior literature. We require at least 12 full weeks of returns

[12]Vyas (2011) also uses ABX indices to provide a benchmark for measuring the timeliness of write-downs.

for the firm to stay our sample. From Markit, we obtain the ABX indices of residential subprime mortgage-backed securities originated in the second half of 2006, the last index vintage constructed before the bear market in subprime ensued. We then compute the weekly change in spread for each tranche of the index (from AAA to BBB-, with all notches in between). We focus on changes in yield spreads (as computed by Markit), rather than index returns, because the indices are composed of fixed coupon instruments. Hence index returns are contaminated by changes in risk-free interest rates, whereas the changes in yield spreads are closer to a pure measure of the change in subprime credit risk. We then compute the first principle component of the weekly change in spread for all the tranche indices (AAA through BBB- and every notch in between) of the second 2006 vintage and label it ΔABX_t. Finally, we include ΔABX_t as a separate factor and estimate the following weekly Fama-French time series regression for each firm i over the July, 2007 to March 2009 period using OLS:

$$\begin{aligned} R_{i,t} - r_{f,t} &= \beta_{i,0} + \beta_{i,ABX}\Delta ABX_t \\ &+ \beta_{i,M}MktRf_t + \beta_{i,V}HML_t + \beta_{i,S}SMB_t + \epsilon_{i,t}, \end{aligned} \tag{1}$$

Where $MktRf_t$, HML_t, and SMB_t are the Fama-French factor returns, and $r_{f,t}$ is the risk-free rate, all for week t, all obtained from Ken French's website. $R_{i,t}$ is firm i's total stock return over week t. Our measure of firm i's subprime exposure is $\beta_{i,ABX}$. Since our subprime credit risk factor is measured as a change in spread, a more negative $\beta_{i,ABX}$ corresponds to greater firm exposure to subprime credit risk during the crisis, as an increase in ΔABX_t means subprime credit risk is deteriorating. We use both the point estimates and standard errors of $\beta_{i,ABX}$ as dependent variables measuring subprime exposure in cross-sectional weighted-least squares regressions.

D. Legal Settlement Data

We hand-collect the legal settlement data from 2007 to the end of April 2016. For the largest four banks in our sample (Bank of America, Citigroup, J.P. Morgan Chase and Wells Fargo) plus the firms acquired by them (Bear Stearns, Wachovia, Countrywide and Merrill Lynch), we use Vanderpool's (2015) report, published by SNL Financial, to code information on their mortgage crisis-related legal settlements.[13] We supplement the report with information from the Securities and Exchange Commission (SEC) website giving all information about mortgage crisis-related settlements resulting from SEC enforcement actions.[14] Vanderpool's report mostly, but not always, ignores SEC settlements, and we are careful not to double count. We further supplement Vanderpool's report by searching for news stories related to legal settlements and fines for these firms in Factiva since the report's publication.

Some settlements imposed on Wells Fargo, Bank of America and J.P. Morgan Chase are, in part, for wrongdoing by the companies they acquired prior to the acquisition. Since these acquisitions, done at the request of regulators, were not entirely voluntary, we attribute the portion of the settlement for acquired company wrongdoing to the acquired company and not the acquirer. This exercise is usually straightforward as sources typically indicate how much of the settlement is attributable to the acquired company. In four cases, however, sources only list the total settlement and attribute it to wrongdoing by multiple firms, without attributing amounts to individual firms. In a lawsuit against J.P. Morgan for wrongdoing by both J.P. Morgan and Bear Stearns, we split the settlement according to each firm's total securitization volume, obtained from 10K filings, over 2005-2007, when mortgage fraud was at its peak.[15] The remaining difficult cases are against Bank of America and

[13] We exclude Goldman Sachs and Morgan Stanley from our sample since, due to their fiscal year end, they did not disclose sufficient information in their proxy for fiscal 2006 for us to compute the duration of CEO debt & equity.

[14] https://www.sec.gov/spotlight/enf-actions-fc.shtml, last accessed on 4/30/2016.

[15] Ideally we would split the settlement according to volume of just residential mortgage securitization, but Bear Stearns' securitization disclosures do not provide sufficient detail.

are related to pre-crisis wrongdoing by this firm as well as acquired firms Merrill Lynch and Countrywide. We split settlement amounts according to residential and commercial mortgage securitization volume by Bank of America and Merrill, as well as total sales of commercial and residential mortgages by Countrywide.[16]

For the remaining firms in our sample not covered by Vanderpool's (2015) report, we identify legal settlements with the aid of Ravenpack and Factiva. First, for each firm, we use Ravenpack to identify all dates, from 2007 to the present, on which the *Dow Jones News Wire*, *Wall Street Journal*, or *Barron's* ran stories flagged by Ravenpack as being related to legal settlements or regulatory enforcement actions. Next, we use Factiva to download and read all news articles about the firm on those dates. We deem a settlement or fine imposed on the firm as related to the mortgage crisis if it involves fraud or misrepresentation in originating mortgages, mortgage-backed securities, collateralized debt obligations (CDOs), or the sale of any other financial product (including mutual funds) related to mortgage-backed securities or CDOs. We also count as mortgage-crisis-related those settlements related to accounting fraud or misrepresentation of losses in mortgages or mortgage backed securities or CDOs during the 2007-2009 period, as well as wrongful or fraudulent origination or servicing practices. Finally, we supplement the above settlements with the same information on SEC enforcement actions in the SEC website mentioned above.

As a final precaution, we note that our Ravenpack subscription only identifies dates upon which news stories are run about the firm in the *Dow Jones News Wire*, *Wall Street Journal*, or *Barron's*. While these three sources almost certainly run all stories about material legal settlements at mid-cap and large-cap firms, their coverage of smaller firms is sometimes less than comprehensive. We thus identify all firms in our sample that have fewer than 300 observations in Ravenpack. We use 300 as the threshold because the small-

[16]Countrywide had no securitization program, but its 2007 10-K indicates that the overwhelming majority of its mortgage sales were to securitizers. Bank of America disclosures are not sufficiently detailed to determine volume of just residential mortgage securitizations.

est firm within our sample that had a crisis-related legal settlement identified by Ravenpack has just under 300 total observations in Ravenpack. We then download all articles about these firms from Factiva, that contain all variations on the key words "fraud", "settle", or "misrepresent". We then read all these articles and identify all crisis-related settlements by the same criteria as above. We find only four firms that have news about crisis-related legal settlements in Factiva but not in Ravenpack.

Once we identify all mortgage crisis-related settlements, we aggregate their dollar amounts by firm. We then use this total firm-level dollar amount as our dependent variable in our legal settlement cross-sectional regressions.

E. Control Variables and alternative dependent variables

From Compustat, we obtain data on each firm's total assets, net income, total common book equity, total liabilities and total equity market capitalization as of the end of fiscal 2006, as well as total common book equity as of the end of fiscal 2005. We define book leverage as the ratio of total liabilities to total assets in 2006. We use the natural logarithm of 2006 assets as our measure for firm size. We compute each firm's market-to-book ratio as the ratio of market equity capitalization plus total liabilities to total assets. We compute return on equity as net income from fiscal 2006 divided by common book equity as of fiscal year-end 2005. To control for governance, we obtain either from BoardEx or proxy statements data on the number of directors, the fraction of directors who are independent, a dummy variable indicating CEO/chairman duality, as well as CEO tenure. To control for information asymmetry, we obtain from I/E/B/S the number of analysts covering the firm as of the end of 2006.[17] Since illiquidity is also likely related to information asymmetry, we use CRSP daily data to compute the Amihud illiquidity measure over 2006. In untabulated

[17]Because the number of analysts is highly correlated with firm size, we follow Duchin, Matsusaka, and Ozbas (2010) and use a size-adjusted number of analysts in our regressions. Specifically, we regress the number of analysts on firm size and use the residual instead.

results, we confirm that all our inferences are unchanged if we use average bid-ask spread over 2006 as an alternative illiquidity measure.

A potential problem with our equity duration measures is that they are mechanically lower for CEOs who tend not to cash out of their vested equity positions. Since optimistic CEOs cash out less, our measures of short-termism might be tainted by CEO optimism. We therefore use Thompson Financial's insider trading database to compute total CEO shares sold over the 2000-2006 period and normalize by total share and share-equivalent option holdings as of the end of 2006. Contrary to the proposition that optimism is tainting our short-termism measure, we find the correlation between normalized share sales and our value and delta-weighted equity duration measures to be negative and statistically insignificant, with point estimates of -7.2% and -5.6%, respectively. Nevertheless, to ensure CEO optimism is not tainting any of our findings, we include normalized pre-crisis CEO share sales as a control variable in all of our specifications. As robustness check, we also compute a normalized share sale measure over the 2000-2005 period and find all of our results are unchanged if we use it as the control variable.

Long-term institutional block holders may create informal incentives for long-term focus. To compute a measure of long-term institutional blockholdings, as well as total institutional holdings, we download from Thompson Financial all data on institutional holdings for each firm as of the end of 2006. We use as a control variable the ratio of total institutional holdings, in shares, to total shares outstanding. In some cases, due to data errors, the ratio turns out to be greater than one, in which case we simply set the value equal to one. We then follow the Bushee (1998, 2001) method to separate institutional holders into transients and long-term holders (i.e., dedicated or quasi-indexer). We then sum the total holdings of all long-term holders who own at least 5% and use this sum, normalized by total shares outstanding, as our measure of total long-term institutional blockholdings.

For completeness, we construct some other dependent variables that have been utilized

in the prior literature studying the effects of financial firm CEO incentives. As a measure of stock return performance during the crisis, we estimate the Fama-French three factor alpha over July 2007 to March 2009 using firm weekly stock returns from CRSP and risk-free rates and factor returns from Ken French's website. For comparison purposes, we also compute the alpha over 2006. We use CRSP delisting data to construct a dummy variable indicating whether a firm was delisted during the crisis period because of insolvency or financial distress. We use daily stock returns from CRSP to construct the tail risk measure of Ellul and Yerramilli (2013) over 2007-2009 and take the time series average. We compute the accounting return on equity over fiscal 2007-2009, defined as cumulative annual net income over 2007-2009 divided by the book value of common equity at the end of 2006. For the subset of firms in our sample that are bank holding companies (BHCs), we obtain from the Quarterly Call Reports (FR Y-9C) the balance sheet value of private-label mortgage-backed securities (our proxy for "toxic" MBS) held in both trading and investment portfolios as of the end of fiscal 2006, normalized by total assets. Also for BHCs, we obtain from the Annual Compustat Bank File net loan charge-offs over 2007-2009, take the time series sum, and scale by total loans as of the end of 2006.

Finally, for our subsample of BHCs, we obtain the following control variables from Call Reports as of the end of fiscal 2006: total deposits, Tier-1 capital, bad loans and total loans, all normalized by total assets.

F. Descriptive Statistics

Descriptive statistics for our ABX betas can be found in Panel A of Table 1. We show betas not only for the first principal component of all the ABX indices, but also for all index tranches from AAA to BBB-. Recall that the beta measures an individual firm's stock return sensitivity to changes in the ABX yield spread, so a negative beta means positive exposure to subprime credit risk. As expected, the betas are negative, on average. We also note that

the absolute magnitude of the beta is higher for the AAA index than it is for the BBB- or the first principle component of all the indices. This pattern is consistent with Stanton and Wallace (2011), who find that a large component of the movements in the AAA tranches during the crisis was due to fluctuations in bank funding liquidity, rather than the credit risk. The lower tranches, on the other hand, have a smaller liquidity pricing component. This is consistent with the distributions of betas on the principal component of the indices being very close to the beta on the BBB- index but much different from the AAA index.

Descriptive statistics on our alternative dependent variables are in Panel B of Table 1. As expected, the majority firms experienced substantial losses during the crisis, as shown by the negative means and median of the Fama-French three factor alpha. Around 7% of our sample firms are delisted during the 2007-2009 financial crisis due to insolvency or financial distress. The rest of the metrics appear similar to what is reported in the prior literature (e.g., Ellul and Yerramilli, 2013, DeYoung, Peng, and Yan, 2013).

Descriptive statistics on the pay and incentive variables are in Panel C of table 1, and they are mostly in line with the prior literature. We note that the mean of our delta-weighted equity duration measure is 0.322, which is in the same ballpark as mean value of 0.38 for financials reported in Gopalan, Milbourn, Song, and Thakor (2014). However, the Gopalan et al. measure of value-weighted duration is much different from ours. This difference arises because their value-weighted measure only considers the duration of new restricted stock and option grants, whereas ours considers both new and old grants that the CEO holds, both vested and unvested, restricted and unrestricted. We choose to include holdings from old grants because for our purposes what matters are the incentives implied by the total holdings of the CEO just before the crisis, regardless of whether the given share of stock or option was granted in the 2006 or in a prior year. Also note that total bonus as a fraction of total pay and total CEO wealth invested in the firm is generally small, suggesting that tests utilizing the bonus as a measure of short-termism are likely of

low power.

At first glance, the magnitude of both equity duration measures seems too small to provide any meaningful incentives for long-term focus. The mean value of approximately 0.32 implies that the average CEO must only wait around four months (one third of a year) before being contractually permitted to sell the average dollar value of stock or options in his portfolio. However, we note that contractual constraints on selling are not the only ones. A CEO immediately selling all equity as it vests would incur large losses both due to signaling and liquidity effects, imposing practical constraints on selling in addition to contractual ones. Hence the combined practical and contractual constraints effectively make the average actual time a CEO must wait to sell longer than the contractual time. However, since our tests are based upon cross-sectional variation in the time to sell, rather than on the absolute value, we do not need our measure to precisely capture the actual time a CEO must wait. All our measure must capture is the cross-sectional variation in this time to wait.

Descriptive statistics on financial and governance characteristics are in Panel D and E of Table 1. We note that all the distributions are in line with prior literature. Some variables, such as total assets, are skewed, so we use their natural logarithm in our tests.

Finally, we present some descriptive statistics on legal settlements related to subprime crisis misrepresentation or fraud in Table 2. We present statistics on total amount aggregated by firm. We also present amounts aggregated by the type of settlement, as well as by the type of party allegedly wronged by the settling firm. Our categories of settlement type include class action lawsuits, Justice Department settlements, civil suits brought by specific institutional counterparties (which include the government-sponsored mortgage guarantors, bond insurers and institutional investors), settlements extracted by the SEC, settlements extracted by state regulators or attorneys general, and settlements extracted by other regulatory agencies. Any Justice settlements that are joined by other plaintiffs

are simply labeled as Justice settlements. Our categories of wronged party include institutional investors in mortgage backed securities (or CDOs), bond insurers, the government-sponsored mortgage guarantors (such as Fannie Mae, Freddie Mac, FHA and others), government entities that provide deposit insurance, mutual fund investors, shareholders and bondholders (in cases alleging that firms failed to properly report subprime-related losses in financial statements), and borrowers (in cases alleging wrongdoing by originators or services). Some of the settlements extracted by the Justice Department were for actions that allegedly harmed more than one category of wronged party, so our table contains some category combinations.

IV. Tests and Results

We conduct three sets of tests. We first examine how our equity and debt duration measures are associated with a given financial institution's exposure to subprime during the crisis. We next examine how our equity and debt duration measures are related to various measures of performance during the crisis, as well as an accounting-based measure of subprime exposure. Finally, we examine how equity duration is related to payouts in settlements related to subprime fraud or misrepresentation.

A. Equity Duration and Subprime Exposure

To test whether equity duration is related to subprime exposure, we estimate the following cross-sectional equation using weighted least squares:

$$\begin{aligned}\beta_{i,ABX} &= \gamma_0 + \gamma_1 \mathrm{EquityDuration}_i + \gamma_2 \mathrm{DebtDuration}_i + \gamma_3 \mathrm{InsideDebtRatio}_i \\ &+ \mathrm{OtherPayVariables}_i + \mathrm{OtherFirmVariables}_i + \epsilon_i, \qquad (2)\end{aligned}$$

where $\beta_{i,ABX}$ is our measure of the firm's exposure to subprime, computed as the weekly return beta of the firm's stock on changes in the ABX index yield spread, where the latter is included as a separate factor in the Fama–French three-factor model. As is standard in the finance literature where an estimated beta is used as a dependent variable, we follow Durnev, Morck, and Yeung (2004) and weight each observation by the inverse of the standard error in our estimate of the dependent variable. We use White's method to compute the standard errors of our coefficient estimates in order to ensure robustness to heteroscedasticity.

We present our coefficient estimates and standard errors from equation (2) in Table 3. We include results for specifications for alternate measures of equity duration, those computed using value and dollar delta as alternate weights. Although our main specifications use the beta on the principle component of all the ABX indices as the dependent variable (presented in columns 1 and 2 in the table), for completeness, we separately include specifications that use betas on the AAA and BBB- indices. We note that equity duration is positive and significant where the first principle component beta is the dependent variable (columns 1 and 2). Since a more negative beta implies greater exposure to subprime, a positive coefficient on equity duration implies that a long equity vesting schedule is associated with less firm exposure to subprime credit risk.

Now consider the economic significance of the above effect. In the regression that uses the ABX principle component exposures as the dependent variable and value-weighted equity duration as an independent variable, the equity duration coefficient takes the value of 0.026. This implies that a one standard deviation shock to equity duration of 0.522 makes the ABX beta less negative by almost 0.014 units. Compared to the mean ABX principle component beta of -0.069 and standard deviation of 0.172, such an effect is economically modest but meaningful.

Another interesting finding is that the effect of the inside debt ratio is economically small and not significant in any specification. This finding is somewhat puzzling since

Van Bekkum (2015), Bennett, Güntay, and Unal (2015) and Tung and Wang (2012), who all find that bank CEO inside debt ratios are related to various measures of downside risk and probability of survival. In later results, we confirm that firms with more CEO inside debt had a lower probability of insolvency during the the crisis, as well as less tail risk. It appears, then, that while inside debt was effective in getting CEOs to expose their firms to less overall downside risk, it was ineffective in getting CEOs to avoid an asset class that was overvalued due to fraud of which they should have been aware.

We also find that the duration of the inside debt does not matter in any specification. While at first glance this result may seem counterintuitive, upon further reflection it is easy to reconcile with existing theory. As Anantharaman, Fang, and Gong (2013) argue, the absolute value of the duration of inside debt does not matter so much as whether the inside debt is of longer or shorter duration than outside debt. If inside debt is of longer duration, then it is effectively junior to outside debt, and hence it reduces the willingness of the CEO to take risks. However, once the duration of inside debt is longer than that of outside debt, theory suggests the degree to which it is longer matters little. Now the debt of financial institutions is predominantly extremely short-term, primarily consisting of instruments such as commercial paper, repos, demand deposits, and overnight interbank loans. Hence so long as inside debt has a duration longer than one year, as it does for virtually every firm in our sample, then the inside debt is virtually guaranteed to have longer duration than outside debt. Hence the cross-sectional variation in the degree of duration is unlikely to have any effect on firm risk exposure, consistent with what we find.

We now consider the specifications in which the betas on the AAA and BBB- indices are the dependent variable. We note that coefficients on both equity duration measures are statistically indistinguishable from zero for the AAA index beta regression. However, recall that Stanton and Wallace (2011) argue much of the movement in the AAA index during the crisis was driven by aggregate funding liquidity shocks, rather than shocks to subprime

credit risk. Hence the beta on the AAA index is more of a measure of firm exposure to aggregate funding liquidity shocks, and theory provides little reason to believe equity duration would impact incentives for the CEO to reduce exposure to funding liquidity shocks. On the other hand, the effect of equity duration on the firm's BBB- index beta is roughly the same as it is for the principle component index beta. In untabulated results, we find the same to be true for all the index betas other than that of the AAA. Hence we conclude that the long-term nature of CEO incentives is associated with less firm exposure to subprime credit risk, but not liquidity risk.

We now consider the effects of the institutional holding variables. Consistent with the notion that transient institutional investors created implicit incentives for CEOs to dive into the subprime business, the coefficient on institutional holdings, when controlling for long-term institutional blockholdings, is negative and significant for the principal component and BBB- beta regressions. Consistent with long-term institutional blockholdings discouraging exposure to subprime, the coefficient on this variable is positive. It is not statistically significant, but we note that the correlation between long-term institutional blockholdings and total institutional holdings is approximately 70%. Hence the standard error is likely biased upward due to near multicollinearity.

We now consider effects of some of our other control variables. In contrast to prior studies finding that incentives for CEO risk-taking led to greater bank risk exposures (i.e., Cerasi and Oliviero, 2014, DeYoung, Peng, and Yan, 2013 and Boyallian and Ruiz-Verdú, 2015), the coefficient on vega is statistically indistinguishable from zero in all regressions. Consistent with Fahlenbrach and Stulz (2011), we find that the CEO equity portfolio delta is unrelated to subprime risk exposure.

B. Equity duration, Performance and Other Metrics

In this section, we study how equity duration is related to a set of other dependent variables utilized in prior literature. We run a series of cross-sectional regressions of the form:

$$\begin{aligned} y_i &= \gamma_0 + \gamma_1 \text{EquityDuration}_i + \gamma_2 \text{DebtDuration}_i + \gamma_3 \text{InsideDebtRatio}_i \\ &+ \text{OtherPayVariables}_i + \text{OtherFirmVariables}_i + \epsilon_i, \end{aligned} \tag{3}$$

Where in different specifications y is set equal to the following: the firm's Fama-French three-factor alpha during the crisis, the pre-crisis alpha of 2006, a dummy indicating the firm was delisted for insolvency or financial distress during the crisis (2007-2009), the average annual tail risk measure of Ellul and Yerramilli (2013) during the crisis, the ratio of private label mortgage-backed securities to total assets on the balance sheet just before the crisis (end of 2006), accounting return on equity during the crisis, and annual loan charge-offs summed over the crisis (2007-2009) normalized by total loans just prior to the crisis (end of 2006). We use weighted least squares to estimate the alpha regressions, using the inverse standard error of the alphas are the weights. The regression for private label mortgage-backed securities, with a censored dependent variable, is estimated using a Tobit model. The remaining regressions are estimated using OLS.[18] In all specifications, we compute White standard errors, making them robust to heteroscedasticity. The results are in Table 4. Panel A contains the results for regressions with market-based dependent variables (alpha, distressed delisting, and tail risk), while Panel B contains results for regressions with the accounting-based dependent variables.

As can be seen in Table 4, equity duration is positively related to in-crisis alpha, confirm-

[18]We do not use a logit or probit model to estimate the delisting regression because the dichotomous dependent variable is sparse, taking the value of 0 more for more than 93% of all observations; it is well known that logit and probit models produce biased estimates in sparse data.

ing that firms with longer equity duration performed better during the crisis. Consistent with long-run-focused CEOs foregoing short-run cash flows during the pre-crisis housing bubble, the point estimates on the equity duration measures are negative in the regression with the 2006 alpha, though not statistically significant. Equity duration is also negatively related to the probability of distressed delisting during the crisis. Equity duration is negatively associated with holdings of private-label mortgage backed securities, consistent with our subprime beta results. On the other hand, equity duration has no statistically significant association with loan charge-offs, tail risk or in-crisis ROE. Since banks have some discretion as when to declare a loan uncollectible, the loan charge-off result is not surprising. While theory suggests CEOs with more long-term incentives will be more prudent in their lending decisions, theory also suggests long-termist CEOs will also be more timely in their recognition and disclosure of bad news. Hence theory provides no clear prediction as to how equity duration should correlate with loan charge-offs. Similar accounting issues contaminate the ROE regressions. Finally, we see no strong theoretical reason for why equity duration should correlate with tail risk one way or the other. Some of the results on the inside debt ratio in Table 4 are consistent with prior research, but others are not. Consistent with prior research finding that inside debt is correlated with lower bank risk taking, we find a negative coefficient on inside debt in the delisting regression and the tail risk regression. On the other hand, contrary to some prior research finding inside debt to be correlated with better firm stock returns during the crisis, the coefficient on inside debt is statistically indistinguishable from zero in our alpha regression. Consistent with our subprime beta results, the coefficient on inside debt is insignificant in the private label mortgage-backed securities holdings regression. Our finding that inside debt resulted in less overall downside risk but had no effect on subprime exposure presents a puzzle whose resolution we leave to future work.

C. Long-term Incentives and Subprime Crisis Legal Settlements

We examine the extent to which the duration of CEO equity and debt holdings as of the end of 2006 can predict legal settlements related to the subprime crisis. Since legal settlements are censored at zero, we run the following Tobit regression:

$$\begin{aligned} y &= \gamma_0 + \gamma_1 \mathrm{EquityDuration}_i + \gamma_2 \mathrm{DebtDuration}_i + \gamma_3 \mathrm{InsideDebtRatio}_i \\ &+ \gamma_4 \mathrm{EquityDuration}_i \times \log(\mathrm{Assets}_i) + \gamma_5 \mathrm{InsideDebtRatio}_i \times \log(\mathrm{Assets}_i) \\ &+ \gamma_6 \mathrm{DebtDuration}_i \times \log(\mathrm{Assets}_i) + \mathrm{OtherPayVariables}_i, \\ &+ \mathrm{OtherFirmVariables}_i + \epsilon_i, \end{aligned} \tag{4}$$

where y is a continuous latent variable on the real line such that Total Settlement Amount $=$ y if $y > 0$, and Total Settlement Amount $= 0$ otherwise. We also assume $\epsilon_i \sim N(0, \sigma^2)$.

We estimate the above parameters using maximum likelihood. We run specifications both with and without interaction terms, however, the interaction specification is likely more salient, as the size of the firm is likely to influence how much the duration measures and inside debt ratios impact the settlement size.

The results are in Table 5. We see that equity duration has a marginally significant negative effect at the 10% level in both specifications without interaction. However, the effect becomes highly significant at the 5% level when the interaction with assets is added (we test for the significance of the sum of the direct effect and interaction effect). We thus find strong evidence that CEOs with long-term incentives exposed their firms to less fraud liability.

Inside debt ratio has an insignificant positive coefficient in the specification without interaction. However, when the interaction with assets is added, the sum of the direct effect and interaction effect of inside debt ratio is significantly negative at the 10% level. We find no similar effects for the inside debt duration, with or without the interaction with

assets.

We further note that profitability and total CEO pay are related to the size of the payout, suggesting that the depth of the firm's pockets mattered. We also find that long-term institutional blockholdings are negatively related to subprime crisis legal liabilities, suggesting long-term blockholdings are associated with incentives for the firm to not expose shareholders to legal liability.

V. Conclusion

We provide some of the first scholarly evidence confirming the suspicion of the Financial Crisis Inquiry Commission that incentives for managerial short-termism contributed to suboptimal firm behavior that led to the subprime crisis. Firms with greater incentives for short-termism, as proxied for by the length of CEO equity and option vesting schedules, were more exposed to subprime credit risk, and were also more highly exposed to subprime fraud-related legal liabilities. We also find some evidence that the ownership of long-term institutional block-holders is associated with a reduction in legal liability related to the subprime crisis.

In contrast to studies that focus on the relation between CEO incentives and bank performance during the crisis, we believe it is possible to draw normative conclusions from our study. Merely showing that some aspect of CEO incentives is correlated with poor bank performance during the crisis, as many prior studies do, is insufficient to establish that CEO incentives led to suboptimal CEO behavior. While such evidence suggests these incentives led CEOs to expose their shareholders to higher systematic risk, such exposure is not suboptimal if properly compensated from an ex-ante perspective, and no study to our knowledge provides evidence on the latter. In contrast, prior work provides strong evidence that subprime credit risk was severely mispriced leading up to the crisis, so expo-

sure to subprime must have been undercompensated. Hence we can draw the normative conclusion from our results that short-term incentives that led to greater firm exposure to subprime credit risk were harmful to long-term shareholders, even from an ex-ante perspective. A good case can also be made that incentives leading to greater legal liability for fraud or misrepresentation are also suboptimal from a social perspective.

While we believe our evidence implies a causal link between long-term incentives, broadly considered, and suboptimal risk exposures, we cannot conclude that it is specifically the CEO equity vesting schedule that has this causal effect. While subprime exposure over 2007-2009 cannot have caused CEO vesting schedules to shorten during 2006, it is possible that some omitted variable correlated with the vesting schedule, and not the vesting schedule itself, drives our results. However, given the nature of the CEO vesting schedule, we believe that if such a variable exist, it is likely related to the overall short-termism or long-termism of the firm in general, and hence it must be related in some manner to formal or informal incentives, or corporate cultural norms, for short-termism or long-termism. Hence while we confidently conclude from our results that it is desirable for financial firms to create long-term incentives for executives, we cannot conclude that a lengthening of CEO equity vesting schedules is a sufficient means to achieve this end.

Appendices

Appendix A Definitions of Variables

Exposure to Subprime Mortgages and Other Performance Measures

- Beta_PC: The sensitivity of the firm's weekly stock returns to the first principle component of the weekly changes in the yield spreads for all the ABX tranches (AAA through BBB- and every notch in between) of ABX indices of subprime residential mortgage-backed securities originated in the second half of 2006. The first principle component is added as a separate factor in the Fama-French three-factor model and it is estimated for each firm using the time-series OLS regression over July 2007 to March 2009. Other ABX index betas are calculated similarly, using the corresponding tranche of the ABX indices.
- Alpha07-09: Each firm's Fama-French three factor alpha using a weekly time series regression over July 2007 to March 2009. Alpha06 is estimated using return data over 2006.
- Delist: A dummy variable that identifies whether the firm was delisted over 2007-2009 because of insolvency or financial distress according to the CRSP delisting data.
- Tail Risk: The time-series mean over 2007-2009 of the negative of the average stock returns during the worst 5% returns days for the firm's stock over the year.
- ROE07-09: The cumulative annual net income over 2007-2009 divided by the book value of common equity at the end of 2006.
- Private MBS/Assets: The ratio of total value of private-label mortgage-backed securities held in both trading and investment portfolios (the sum of BHCK1709, BHCK1733, BHCK1713, BHCK1736, BHCK3536) to the book value of total assets (BHCK2170).
- Charge-Offs/Loans: The ratio of accumulated net charge-offs (nco) over 2007-2009 to total loans of 2006 (lntal).

CEO Pay and Incentive Measures

- Equity Duration: The weighted average time to the CEO's equity vesting. Weights are either based on the equity's value or the delta.
- Inside Debt Duration: The value-weigthed average of the Macaulay duration of the CEO's accumulated pension benefits and non-qualified deferred compensation.
- Inside Debt Ratio: The CEO-firm relative debt-to-equity ratio, calculated as the CEO's debt-to-equity ratio divided by the firm's debt-to-equity ratio. The CEO's debt-to-equity ratio is the sum of the present value of the CEO's pension and non-qualified deferred compensation, divided by the value of the CEO's option and stock holdings. Firm's debt-to-equity ratio is the sum of long-term debt plus debt in current liabilities, divided by the firm's market value of equity.

- Equity Ownership: The CEO's total disclosed beneficial ownership that excludes options that are exercisable or will become exercisable within 60 days, normalized by total shares outstanding.
- Equity Delta: The dollar change in the value of the CEO's stock and option portfolio due to a 1% increase in the value of the firm's common stock price ($ Million).
- Equity Vega: The dollar change in the value of the CEO's option grants and any option holdings for a 0.01 change in the annualized standard deviation of the firm's stock returns ($ Million).
- Salary: The CEO's salary compensation ($ Million).
- Bonus: The CEO's the annual bonus plus non-equity incentive plan payouts. ($ Million).
- Annual Compensation: The CEO's total annual compensation.
- Value of Shares: The total dollar value of the CEO's stock holdings ($ Million).
- value of Options: The total dollar value of the CEO's option holdings ($ Million).
- Value of Equity portfolio: The sum of the CEO's share value and option value ($ Million).
- Accumulated Pension: The present value of the CEO's accumulated pension benefits ($ Million).
- Deferred Compensation: The fiscal year-end balance of the CEO's non-qualified deferred compensation ($ Million).
- Value of Inside Debt: The sum of the CEO's accumulated pension and deferred compensation ($ Million).
- Pre-Crisis CEO Sales: total CEO shares sold over the 2000-2006 period and normalize by total share and share-equivalent option holdings as of the end of 2006.

Financial Characteristics

- Assets: The book value of the firm's total assets (at or BHCK2170).
- Market Cap.: The market value of the firm's total outstanding shares (prcc_f $*$ csho).
- ROE: Ratio of net income (ni) to equity book value at the beginning of the fiscal year (ceq).
- Market-to-book: The ratio of market equity capitalization plus total liabilities (at + (prcc_f $*$ csho) - ceq - txdb) to total assets.
- Book leverage: The ratio of total liabilities (at-ceq) to total assets.
- Depository bank: A dummy variable that identifies whether the firm is a depository bank.
- Deposits/Assets: The ratio of total deposits (BHDM6631+BHDM6636+BHFN6631+BHFN6636) to assets.

- Tier-1 Capital/Assets: The ratio of Tier-1 capital (BHCK8274) to assets.
- Bad loans/Assets: The ratio of the sum of loans past due 90 days or more (BHCK5525) and nonaccrual loans (BHCK5526) to assets.
- loans/Assets: The ratio of total loans (BHCK2122) to assets.

Governance Characteristics

- Institutional Ownership: The ratio of total 13-F institutional holdings, in shares, to total shares outstanding.
- Long-term Blockholding: The total holdings of all dedicated or quasi-indexer holders who own at least 5%, scaled by total shares outstanding.
- Board Size: The number of directors on the firm's board of directors.
- Board Independence: The fraction of independent directors on the firm's board of directors.
- CEO-Chair Duality: A dummy variable that identifies whether the firm's CEO and Chairman of its board of directors is the same person.
- CEO Tenure: The number of years that the CEO has spent in his or her current position at the firm.
- Number of Analysts: The number of analysts who posted forecasts about the firm in a given year.
- Amihud Liquidity: The Amihud (2002) illiquidity measure, defined as the average over a year of $10^7 * |\mathtt{ret}_{it}|/\mathtt{vol}_{it}$, where $\mathtt{ret}_{it}$ is the firm's daily stock return and $\mathtt{vol}_{it}$ is the daily stock dollar volume.

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Table 1: Descriptive Statistics

The table reports descriptive statistics for the key variables used in our analysis. All variables are defined in Appendix A. Panel A and B report market- and accounting-based dependent variables. All the dependent variables are measured over 2007-2009 except Alpha06 and Private MBS/Assets. Alpha06 is estimated over 2006 and Private MBS/Assets is taken as the end of 2006. All the variables in Panel B are expressed in percentage (except the dummy Delist). Panel C to E report CEO compensation and firm-level control variables used in our analysis. They are all measured as the end of 2006. All variables related to dollar value are expressed in millions of dollars.

	Mean	P5	P25	Median	P75	P95	Std.Dev.	N
Panel A: Exposure to Subprime Mortgages								
Beta_PC	-0.069	-0.308	-0.103	-0.036	0.005	0.076	0.172	254
Beta_AAA	-0.494	-3.135	-0.839	-0.197	0.152	1.177	1.544	254
Beta_AA	-0.270	-1.076	-0.377	-0.184	-0.068	0.167	0.495	254
Beta_A	-0.118	-0.465	-0.189	-0.067	0.010	0.122	0.311	254
Beta_BBB	-0.104	-0.502	-0.178	-0.048	0.017	0.135	0.266	254
Beta_BBB-	-0.068	-0.423	-0.103	-0.026	0.041	0.135	0.245	254
Panel B: Other Performance Measures								
Alpha07-09	-0.470	-2.812	-1.031	-0.161	0.424	1.140	1.453	254
Alpha06	-0.003	-0.765	-0.290	-0.003	0.274	0.780	0.728	254
Delist	0.067	0	0	0	0	1	0.250	254
Tail Risk	9.818	5.005	7.252	8.671	11.647	17.656	4.376	254
ROE07-09	-4.127	-85.921	-31.105	7.341	28.578	51.213	46.586	244
Private MBS/Assets	1.171	0.000	0.000	0.031	1.192	4.225	2.998	202
Charge-Offs/Loans	-3.832	-10.949	-5.176	-3.073	-1.428	-0.465	2.919	190
Panel C: CEO Pay and Incentive								
Equity Duration (value)	0.319	0.000	0.017	0.140	0.420	1.253	0.522	254
Equity Duration (delta)	0.322	0.000	0.028	0.163	0.408	1.329	0.500	254
Inside Debt Duration	8.759	0.000	1.000	9.000	14.000	21.000	7.134	254
Inside Debt Ratio	0.375	0.000	0.004	0.132	0.524	1.978	0.528	254
Equity Ownership	0.026	0.001	0.002	0.006	0.016	0.139	0.064	254
Equity Delta	0.620	0.011	0.049	0.118	0.401	2.524	2.911	254
Equity Vega	0.081	0.000	0.004	0.015	0.047	0.414	0.211	254
Salary	0.532	0.233	0.350	0.454	0.661	1.000	0.285	254
Bonus	0.815	0.000	0.092	0.247	0.587	2.982	2.237	254
Annual Comp.	2.978	0.419	0.706	1.119	2.584	9.946	6.195	254

Table 1: Descriptive Statistics (Continued)

	Mean	P5	P26	Median	P75	P95	Std.Dev.	N
Value of Equity Portfolio	54.166	0.682	3.423	9.680	35.355	226.163	286.279	254
Value of Shares	44.934	0.324	1.905	5.685	23.432	173.031	280.551	254
Value of Options	9.232	0.000	0.700	2.068	7.495	40.163	24.164	254
Value of Inside Debt	4.297	0	0.071	0.837	3.442	16.900	14.873	254
Accumulated Pensions	2.021	0	0.000	0.251	1.895	9.460	4.967	254
Deferred Compensation	2.276	0	0.000	0.130	0.762	9.145	13.207	254
Bonus/Salary	1.160	0	0.227	0.603	1.050	4.333	2.376	254
Bonus/Annual Comp.	0.223	0	0.100	0.208	0.314	0.508	0.164	254
Bonus/(CEO Equity+Ins. Debt)	0.060	0	0.006	0.020	0.045	0.131	0.254	254
Pre-Crisis CEO Sales	0.393	0	0.012	0.197	0.490	1.581	0.551	254
Panel D: Financial Characteristics								
Assets	40256	1033	2048	3496	9829	121351	187670	254
Market Cap.	6503	269	401	731	1746	23787	27695	254
ROE	0.116	0.031	0.085	0.123	0.146	0.212	0.075	254
Market-to-Book	1.110	1.024	1.060	1.092	1.130	1.235	0.095	254
Book Leverage	0.881	0.732	0.890	0.905	0.920	0.937	0.102	254
Depository Bank (0/1)	0.909	0	1	1	1	1	0.288	254
Deposits/Assets	0.733	0.533	0.691	0.758	0.804	0.851	0.107	202
Tier-1 Capital/Assets	0.086	0.063	0.077	0.085	0.094	0.114	0.016	202
Bad loans/Assets	0.004	0.001	0.002	0.003	0.006	0.013	0.004	202
Loans/Assets	0.695	0.445	0.651	0.715	0.763	0.849	0.115	202
Panel E: Governance Characteristics								
Institutional Ownership	0.454	0.115	0.273	0.459	0.599	0.883	0.227	254
Long-term Blockholding	0.096	0.000	0.000	0.067	0.152	0.307	0.112	254
Board Size	11.843	7	9	12	14	18	3.480	254
Board Independence	0.770	0.571	0.706	0.786	0.857	0.917	0.115	254
CEO-Chair Duality (0/1)	0.622	0	0	1	1	1	0.486	254
CEO Tenure	5.929	0	2	5	8	17	5.508	254
Number of Analysts	8.391	1	3	7	11	23	6.613	254
Amihud Illiquidity	0.191	0.001	0.014	0.071	0.245	0.703	0.306	254

Table 2: Descriptive Statistics on Legal Settlements related to Subprime Crisis Misrepresentation or Fraud

This table reports descriptive statistics for legal settlements related to subprime crisis misrepresentation or fraud. Panel A reports the fraction of our sample firms involved in the settlements and the settlement amounts. Panel B reports settlement incidents and amounts by settlement types. Panel C reports settlement incidents and amounts by the type of party allegedly wronged by the settling firm. All the settlement amounts are expressed in billions of dollars.

	Mean	Median	Total	N
Panel A: Legal Settlements by Firms				
Involved in Settlement (0/1)	0.126	0	32	254
Total Settlement Amount ($ Bil)	0.584	0	148.342	254
Panel B: Legal Settlement Amount by Types ($ Bil)				
Other Civil Settlements	1.194	0.392	50.132	42
SEC	0.087	0.053	1.995	23
Justice Department	3.454	1.235	69.071	20
Class Action Lawsuits	0.372	0.210	7.432	20
Other Regulatory Agencies	0.775	0.109	9.302	12
State Regulators or Attorneys General	2.603	1.004	10.410	4
Panel C: Legal Settlement Amount by Wronged Parties ($ Bil)				
Government Sponsored Entities (GSEs)	1.144	0.395	35.470	31
Shareholders	0.232	0.053	5.800	25
Institutional Investors in MBS	0.660	0.167	14.512	22
Borrowers	2.106	0.461	46.330	22
Bond Insurer	0.727	0.650	6.540	9
Institutional Investors in MBS and GSEs	9.151	10.000	36.605	4
Mutual Fund Investors	0.160	0.164	0.638	4
Deposit Insurer	0.109	0.109	0.218	2
Bondholders	0.730	0.730	0.730	1
Borrowers and GSEs	1.500	1.500	1.500	1

Table 3: End-of-2006 CEO Myopia and Subprime Exposure during the Crisis

The table reports the results of cross-sectional regressions that examine whether firms with longer CEO equity duration as the end of fiscal year 2006 have less subprime exposure during the 2007-2009 financial crisis. Beta_PC denotes the sensitivity of the firm's weekly stock returns to the first principle component of the weekly changes in the yield spreads for all the tranches (AAA, AA, A, BBB, BBB-) of the ABX indices of subprime residential mortgage-backed securities originated in the second half of 2006. We estimate Beta_PC for each firm over the July 2007 to March 2009 period, by running a time-series Fama–French three-factor regression and including ABX spread change as a separate factor. Beta_AAA and Beta_BBB- are estimated similarly, using AAA and BBB- tranches, respectively. All other variables are defined in Appendix A. The regression controls for CEO compensation and firm characteristics in 2006. Coefficient estimates are obtained from weighted least squares (WLS), where each observation is weighted by the inverse of the standard error in the estimate of the dependent variable. Standard errors for the WLS (reported in parentheses) are adjusted for heteroscedasticity. ***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3: End-of-2006 CEO Myopia and Subprime Exposure during the Crisis (Continued)

	Beta_PC		Beta_AAA		Beta_BBB-	
	(1)	(2)	(3)	(4)	(5)	(6)
Equity Duration (value)	0.026***		0.128		0.037***	
	(0.009)		(0.091)		(0.014)	
Equity Duration (delta)		0.027***		0.152		0.038***
		(0.009)		(0.098)		(0.014)
Inside Debt Duration	0.000	0.000	0.002	0.002	0.000	0.000
	(0.001)	(0.001)	(0.007)	(0.006)	(0.001)	(0.001)
Inside Debt Ratio	0.010	0.011	0.014	0.020	0.012	0.013
	(0.008)	(0.009)	(0.072)	(0.072)	(0.013)	(0.013)
Equity Ownership	-0.145	-0.142	-0.472	-0.489	-0.211	-0.207
	(0.107)	(0.107)	(1.244)	(1.239)	(0.152)	(0.152)
Log of Equity Delta	0.008	0.008	0.032	0.034	0.011	0.011
	(0.005)	(0.005)	(0.061)	(0.061)	(0.008)	(0.008)
Log of Equity Vega	-0.002	-0.002	0.053	0.052	-0.004	-0.005
	(0.004)	(0.004)	(0.034)	(0.034)	(0.005)	(0.005)
Log of Annual Comp.	-0.020*	-0.020*	0.001	-0.004	-0.018	-0.018
	(0.010)	(0.010)	(0.088)	(0.089)	(0.015)	(0.015)
Pre-Crisis CEO Sales	-0.002	-0.002	-0.044	-0.047	-0.001	-0.001
	(0.008)	(0.008)	(0.071)	(0.071)	(0.010)	(0.010)
Log of Book Assets	-0.001	-0.001	-0.072	-0.071	-0.001	-0.001
	(0.007)	(0.007)	(0.077)	(0.077)	(0.011)	(0.011)
Log of Market-to-Book	0.157**	0.153**	0.788	0.771	0.181	0.176
	(0.074)	(0.074)	(0.892)	(0.895)	(0.110)	(0.110)
Book Leverage	0.100	0.100	1.198*	1.194*	0.169	0.169
	(0.074)	(0.074)	(0.705)	(0.705)	(0.108)	(0.108)
ROE	0.028	0.033	0.406	0.457	0.112	0.120
	(0.089)	(0.089)	(0.752)	(0.758)	(0.138)	(0.138)
Depository Bank (0/1)	0.011	0.010	0.303	0.298	0.016	0.015
	(0.024)	(0.023)	(0.288)	(0.289)	(0.039)	(0.039)
Institutional Ownership	-0.067*	-0.065*	-0.405	-0.398	-0.122**	-0.121**
	(0.034)	(0.034)	(0.421)	(0.420)	(0.049)	(0.049)
Long-term Blockholding	0.037	0.037	-0.901	-0.905	0.070	0.069
	(0.059)	(0.059)	(0.791)	(0.790)	(0.090)	(0.090)
Board Size	0.004***	0.004***	0.013	0.014	0.005**	0.005**
	(0.001)	(0.001)	(0.013)	(0.013)	(0.002)	(0.002)
Board Independence	0.038	0.040	0.907**	0.918**	0.032	0.035
	(0.044)	(0.044)	(0.386)	(0.389)	(0.062)	(0.063)
CEO-Chair Duality (0/1)	-0.001	0.000	0.104	0.110	-0.008	-0.007
	(0.010)	(0.010)	(0.106)	(0.106)	(0.015)	(0.015)
CEO Tenure	-0.000	-0.000	0.000	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.007)	(0.007)	(0.001)	(0.001)
Number of Analysts	-0.001	-0.001	-0.012	-0.012	-0.001	-0.001
	(0.001)	(0.001)	(0.011)	(0.011)	(0.002)	(0.002)
Amihud Illiquidity	0.010	0.010	0.051	0.052	0.006	0.005
	(0.020)	(0.020)	(0.146)	(0.146)	(0.025)	(0.025)
Constant	-0.092	-0.097	-2.132***	-2.142***	-0.170	-0.177
	(0.087)	(0.087)	(0.752)	(0.751)	(0.126)	(0.126)
Observations	254	254	254	254	254	254
R^2	0.146	0.147	0.127	0.128	0.129	0.129

Table 4: End-of-2006 CEO Myopia and Other Performance Measures

The table reports the results of cross-sectional regressions that examine whether firms with longer CEO equity duration as the end of fiscal year 2006 perform better during the 2007-2009 financial crisis. Panel A reports results on market-based dependent variables. In columns (1) and (2), Alpha07-09 is a firm's Fama-French three-factor alpha estimated from a time series regression using the firm's weekly returns over July 2007 to March 2009. In columns (3) and (4), Alpha06 is the firm's Fama-French three-factor alpha for the pre-crisis period of 2006. In columns (5) and (6), Delist identifies whether the firm was delisted over 2007-2009 because of insolvency or financial distress based on the CRSP delisting data. In columns (7) and (8), Tail Risk is the negative of the average stock returns during the worst 5% returns days for the firm's stock over a year, and we use its time-series average over 2007-2009. Both Alphas and Tail Risk are expressed in percentage. Panel B reports results on accounting-based dependent variables. In columns (1) and (2), ROE07-09 is return on equity, calculated as the cumulative annual net income over 2007-2009 divided by the book value of common equity at the end of 2006. In columns (3) and (4), Private MBS/Assets denotes the ratio of private-label mortgage-backed securities held in both trading and investment portfolios to total assets as the end of 2006. In column (5) and (6), Charge-Offs/Loans is the accumulated net charge-offs over 2007-2009, normalized by total loans as the end of 2006. Private MBS/Assets and Charge-Offs/Loans are expressed in percentage. All other variables are defined in Appendix A. The regression controls for CEO compensation and firm characteristics in 2006. Coefficient estimates when the dependent variable is Alpha07-09 (or Alpha06) are obtained from weighted least squares, where each observation is weighted by the inverse of the standard error in the estimate of the dependent variable. Coefficient estimates for Private MBS regressions are obtained from Tobit. OLS is used for regressions of the remaining dependent variables. Standard errors (reported in parentheses) are adjusted for heteroscedasticity. ***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4: End-of-2006 CEO Myopia and Other Performance Measures (Continued)

Panel A: Market-based Performance Measures

	Alpha07-09 (%)		Alpha06 (%)		Delist		Tail Risk (%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Equity Duration (value)	0.177**		-0.074		-0.047**		-0.395	
	(0.088)		(0.058)		(0.023)		(0.499)	
Equity Duration (delta)		0.223**		-0.093		-0.047*		-0.540
		(0.089)		(0.060)		(0.025)		(0.491)
Inside Debt Duration	0.007	0.007	-0.003	-0.004	0.001	0.001	-0.024	-0.025
	(0.007)	(0.007)	(0.004)	(0.004)	(0.003)	(0.003)	(0.034)	(0.034)
Inside Debt Ratio	0.025	0.035	0.039	0.035	-0.046*	-0.047*	-0.795*	-0.813*
	(0.101)	(0.101)	(0.061)	(0.061)	(0.024)	(0.024)	(0.455)	(0.455)
Equity Ownership	0.711	0.671	-0.082	-0.063	-0.117	-0.121	-2.243	-2.159
	(1.683)	(1.685)	(0.656)	(0.657)	(0.478)	(0.479)	(5.111)	(5.098)
Log of Equity Delta	-0.044	-0.040	0.018	0.016	0.012	0.013	0.327	0.314
	(0.058)	(0.059)	(0.036)	(0.036)	(0.015)	(0.015)	(0.308)	(0.308)
Log of Equity Vega	0.048	0.047	-0.036	-0.036	-0.001	-0.000	-0.111	-0.113
	(0.044)	(0.044)	(0.024)	(0.024)	(0.014)	(0.014)	(0.230)	(0.228)
Log of Annual Comp.	-0.255**	-0.267***	0.070	0.076	0.026	0.025	0.512	0.552
	(0.103)	(0.103)	(0.055)	(0.055)	(0.027)	(0.027)	(0.493)	(0.487)
Pre-Crisis CEO Sales	0.043	0.039	-0.029	-0.026	-0.024	-0.023	0.048	0.052
	(0.088)	(0.088)	(0.037)	(0.038)	(0.021)	(0.021)	(0.393)	(0.389)
Log of Book Assets	-0.058	-0.056	-0.025	-0.027	-0.043**	-0.043**	-0.009	-0.019
	(0.080)	(0.080)	(0.037)	(0.037)	(0.019)	(0.019)	(0.347)	(0.347)
Log of Market-to-Book	1.297	1.273	0.961	0.966	-0.556**	-0.552**	-12.770***	-12.886***
	(0.954)	(0.950)	(0.590)	(0.588)	(0.252)	(0.250)	(3.680)	(3.661)
Book Leverage	-0.316	-0.326	0.318	0.307	0.160	0.158	-1.463	-1.507
	(0.851)	(0.853)	(0.528)	(0.530)	(0.291)	(0.291)	(3.566)	(3.556)
ROE	-0.289	-0.202	0.377	0.346	-0.025	-0.031	-3.306	-3.494
	(0.929)	(0.924)	(0.805)	(0.806)	(0.277)	(0.278)	(3.326)	(3.343)
Depository Bank (0/1)	0.275	0.268	0.020	0.025	-0.081	-0.079	-1.583	-1.562
	(0.305)	(0.304)	(0.160)	(0.161)	(0.125)	(0.125)	(1.432)	(1.426)
Institutional Ownership	-0.320	-0.308	-0.087	-0.098	0.344**	0.341*	4.122*	4.101*
	(0.497)	(0.495)	(0.201)	(0.201)	(0.174)	(0.173)	(2.196)	(2.195)
Long-term Blockholding	0.421	0.416	-0.287	-0.276	-0.171	-0.167	-0.996	-0.987
	(0.803)	(0.801)	(0.362)	(0.362)	(0.300)	(0.301)	(4.870)	(4.890)
Board Size	0.009	0.010	0.004	0.003	-0.006	-0.006	-0.182**	-0.184**
	(0.017)	(0.017)	(0.009)	(0.009)	(0.005)	(0.005)	(0.084)	(0.084)
Board Independence	0.332	0.344	0.673**	0.666**	-0.078	-0.081	-1.074	-1.066
	(0.443)	(0.442)	(0.285)	(0.285)	(0.129)	(0.128)	(2.332)	(2.321)
CEO-Chair Duality (0/1)	0.244**	0.253**	0.030	0.026	-0.063*	-0.064*	-1.277**	-1.303**
	(0.118)	(0.118)	(0.062)	(0.062)	(0.034)	(0.034)	(0.560)	(0.562)
CEO Tenure	0.010	0.010	-0.008	-0.008	0.003	0.003	0.009	0.008
	(0.009)	(0.009)	(0.005)	(0.005)	(0.004)	(0.004)	(0.052)	(0.052)
Number of Analysts	-0.029**	-0.030**	-0.002	-0.002	-0.013***	-0.013***	-0.058	-0.056
	(0.014)	(0.014)	(0.007)	(0.007)	(0.004)	(0.004)	(0.075)	(0.075)
Amihud Illiquidity	-0.486***	-0.484***	0.141	0.137	-0.021	-0.021	1.518	1.501
	(0.185)	(0.184)	(0.098)	(0.098)	(0.044)	(0.044)	(1.032)	(1.029)
Constant	1.709**	1.708**	-1.188**	-1.175**	0.231	0.241	11.545***	11.577***
	(0.814)	(0.812)	(0.509)	(0.510)	(0.268)	(0.267)	(3.642)	(3.629)
Observations	254	254	254	254	254	254	254	254
R^2	0.134	0.137	0.115	0.117	0.206	0.206	0.233	0.234

Table 4: End-of-2006 CEO Myopia and Other Performance Measures (Continued)

	Panel B: Accounting-based Performance Measures					
	ROE07-09		Private MBS/Assets (%)		Charge-Offs/Loans (%)	
	(1)	(2)	(3)	(4)	(5)	(6)
Equity Duration (value)	-0.018		-1.197**		-0.054	
	(0.057)		(0.535)		(0.426)	
Equity Duration (delta)		-0.002		-1.378**		0.019
		(0.058)		(0.621)		(0.418)
Inside Debt Duration	0.004	0.004	0.073*	0.072*	0.055*	0.055*
	(0.004)	(0.004)	(0.039)	(0.039)	(0.029)	(0.028)
Inside Debt Ratio	0.060	0.062	-0.378	-0.415	0.012	0.019
	(0.064)	(0.064)	(0.529)	(0.530)	(0.499)	(0.501)
Equity Ownership	0.142	0.128				
	(0.634)	(0.630)				
Log of Equity Delta	-0.030	-0.028	0.033	0.023	-0.111	-0.105
	(0.029)	(0.029)	(0.237)	(0.237)	(0.187)	(0.186)
Log of Equity Vega	-0.005	-0.005	0.138	0.143	-0.135	-0.130
	(0.026)	(0.026)	(0.210)	(0.209)	(0.164)	(0.163)
Log of Annual Comp.	-0.036	-0.041	0.221	0.240	-0.927***	-0.951***
	(0.064)	(0.064)	(0.615)	(0.614)	(0.348)	(0.343)
Pre-Crisis CEO Sales	0.019	0.020	0.498	0.542	0.243	0.248
	(0.048)	(0.048)	(0.554)	(0.560)	(0.398)	(0.395)
Log of Book Assets	0.057	0.058	0.280	0.278	0.190	0.199
	(0.043)	(0.043)	(0.586)	(0.583)	(0.338)	(0.338)
Log of Market-to-Book	0.892*	0.909*	-3.607	-3.454	-8.628	-8.493
	(0.510)	(0.509)	(6.764)	(6.748)	(8.270)	(8.246)
Book Leverage	0.243	0.245	18.617	18.525	-11.650	-11.201
	(0.417)	(0.418)	(13.159)	(13.278)	(8.814)	(8.879)
ROE	1.710***	1.722***	-2.435	-2.932	3.800	3.739
	(0.314)	(0.315)	(4.494)	(4.558)	(7.361)	(7.342)
Depository Bank (0/1)	0.211	0.210				
	(0.158)	(0.158)				
Institutional Ownership	-0.231	-0.231	0.270	0.186	-1.298	-1.304
	(0.243)	(0.243)	(2.224)	(2.239)	(1.757)	(1.759)
Long-term Blockholding	0.544	0.547	3.982	3.989	3.812	3.830
	(0.408)	(0.408)	(5.295)	(5.279)	(2.820)	(2.825)
Board Size	0.007	0.007	-0.063	-0.066	0.034	0.034
	(0.009)	(0.009)	(0.096)	(0.097)	(0.067)	(0.067)
Board Independence	0.095	0.090	-5.654**	-5.741**	2.131	2.123
	(0.261)	(0.261)	(2.843)	(2.850)	(1.989)	(1.987)
CEO-Chair Duality (0/1)	0.086	0.087	-0.654	-0.706	0.916*	0.922*
	(0.063)	(0.063)	(0.540)	(0.543)	(0.512)	(0.515)
CEO Tenure	0.005	0.005	-0.010	-0.011	0.027	0.028
	(0.006)	(0.006)	(0.056)	(0.057)	(0.043)	(0.043)
Number of Analysts	0.000	0.000	0.284**	0.287**	-0.025	-0.026
	(0.007)	(0.007)	(0.128)	(0.129)	(0.059)	(0.058)
Amihud Illiquidity	0.056	0.058	-0.460	-0.499	1.092	1.104
	(0.089)	(0.089)	(1.194)	(1.194)	(0.692)	(0.691)
Tier-1 Capital/Assets			0.243	0.248	-0.234	-0.232
			(0.239)	(0.241)	(0.155)	(0.154)
Bad loans/Assets			-1.200	-1.211	-1.718**	-1.722**
			(0.796)	(0.801)	(0.666)	(0.666)
Deposits/Assets			-0.050	-0.047	0.001	0.001
			(0.049)	(0.048)	(0.028)	(0.028)
Loans/Assets			-0.143***	-0.145***	-0.043*	-0.043*
			(0.052)	(0.052)	(0.022)	(0.022)
Constant	-1.062**	-1.053**	-4.217	-3.968	15.374*	14.938
	(0.428)	(0.429)	(13.810)	(13.912)	(9.253)	(9.357)
Observations	244	244	202	202	190	190
R^2(or Log Likelihood)	0.206	0.206	-348.156	-347.923	0.233	0.232

Table 5: End-of-2006 CEO Myopia and Mortgage related Fraud Settlements

The table presents the results of Tobit regressions that examine the relation between total legal settlements related to the subprime crisis and CEO equity duration. The legal settlements are aggregated at the firm level and are expressed in billions of dollars. All other variables are defined in Appendix A. We standardize equity duration, inside debt ratio, inside debt duration, and log value of book assets in all regressions. In column (3) and (4), we interact log book assets with equity duration, inside debt ratio, inside debt duration, respectively. The regression controls for CEO compensation and firm characteristics in 2006. Standard errors (reported in parentheses) are adjusted for heteroscedasticity. ***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Equity Duration (value)	-6.680*		-3.124	
	(3.460)		(2.347)	
Equity Duration (delta)		-6.448*		-3.213
		(3.426)		(2.038)
Equity duration interacted with				
Log of Book Assets			-1.755**	-1.990**
			(0.821)	(0.891)
Inside Debt Duration	-1.059	-1.114	-0.511	-0.431
	(1.283)	(1.287)	(1.073)	(1.043)
Inside debt duration interacted with				
Log of Book Assets			-0.735	-0.948
			(0.715)	(0.715)
Inside Debt Ratio	0.333	0.296	-0.203	-0.160
	(1.225)	(1.231)	(1.008)	(1.004)
Inside debt ratio interacted with				
Log of Book Assets			-2.944***	-2.938***
			(1.089)	(1.107)
Log of Book Assets	0.231	0.252	-1.686	-1.635
	(2.275)	(2.345)	(2.221)	(2.230)
Equity Ownership	-25.450	-22.667	-13.563	-12.785
	(29.210)	(29.480)	(21.624)	(21.637)
Log of Equity Delta	-0.878	-0.893	-0.652	-0.599
	(0.979)	(0.995)	(1.003)	(0.998)
Log of Equity Vega	0.534	0.604	0.504	0.523
	(0.812)	(0.850)	(0.803)	(0.823)
Log of Annual Comp.	7.370**	7.261**	7.647***	7.524***
	(3.029)	(3.070)	(2.755)	(2.712)
Pre-Crisis CEO Sales	1.385	1.816	1.588	1.907
	(1.302)	(1.409)	(1.202)	(1.268)
Log of Market-to-Book	-58.098**	-55.459*	-67.324**	-65.875**
	(29.091)	(29.726)	(29.923)	(30.132)
Book Leverage	15.768	14.022	21.564	19.054
	(13.670)	(13.689)	(16.409)	(15.286)
ROE	48.853*	44.211*	49.491**	46.596**
	(26.532)	(26.577)	(23.891)	(23.264)
Depository Bank (0/1)	-13.459**	-12.863**	-12.648**	-12.233**
	(6.216)	(6.145)	(5.503)	(5.458)
Institutional Ownership	7.515	7.952	5.684	5.719
	(6.835)	(6.895)	(6.557)	(6.522)
Long-term Blockholding	-31.353*	-31.571*	-34.444**	-34.709**
	(15.933)	(16.056)	(15.737)	(15.745)
Board Size	-0.354	-0.394	-0.247	-0.296
	(0.323)	(0.335)	(0.237)	(0.240)
Board Independence	-14.669*	-14.961*	-14.922*	-15.540*
	(8.094)	(8.298)	(8.310)	(8.445)
CEO-Chair Duality (0/1)	6.928**	6.305**	6.541**	6.100**
	(2.944)	(2.796)	(3.075)	(3.019)
CEO Tenure	-0.211	-0.193	-0.221	-0.214
	(0.184)	(0.189)	(0.194)	(0.200)
Number of Analysts	0.038	0.046	0.092	0.099
	(0.340)	(0.355)	(0.317)	(0.325)
Amihud Illiquidity	7.195**	7.298**	5.394*	5.410*
	(2.987)	(3.072)	(2.879)	(2.955)
Constant	-58.878**	-56.358**	-65.475**	-61.699**
	(28.196)	(28.341)	(28.190)	(27.265)
Observations	254	254	254	254
Log Likelihood	-130.668	-131.652	-126.937	-127.451