CHAPTER I

DO CEO EQUITY INCENTIVES AFFECT FIRMS' COST OF PUBLIC DEBT FINANCING?

1. Introduction

The past twenty years witnessed an explosion in the use of equity-based compensation in the form of restricted stock and especially stock options, and by the end of the 1990s stock options have become the single most important component of CEO compensation (Hall and Liebman (1998) and Murphy (1999, 2002)). Because of their convex payoff structures, stock options and to a lesser extent, stock,[1] encourage CEOs to take more risk, alleviating the agency problem between shareholders and managers due to managerial risk aversion (Haugen and Senbet (1981) and Smith and Stulz (1985)). The interest alignment, however, does not come without cost. One potential adverse consequence is a higher cost of debt capital if a firm's potential creditors perceive the risk-taking incentives provided by stock and stock options as harmful and charge a higher credit risk premium on the firm's future debt offerings. But there has been little empirical evidence on this question.[2]

We systematically investigate this issue by relating CEO stock and stock option ownership at a firm to the rating and yield spread of the firm's new public debt offerings. As will become clear shortly, managerial equity incentives from stock and stock options are of multiple dimensions and sometimes have conflicting effects on debtholder wealth, making their overall impact on the cost of debt financing less than clear cut.

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[1] Stock can be considered as a call option written on total firm value with the book value of liabilities as exercise price (Black and Scholes (1973)). Therefore, the value of stock increases with the variance of total firm value.

[2] DeFusco, Johnson, and Zorn (1990) come closest to examining this issue. In an event study setting, they find negative abnormal returns for bonds of 36 firms announcing adoptions of executive stock option plans from 1978 to 1982.

On the one hand, stock and stock options are able to mitigate the agency problem between managers and shareholders due to the separation of ownership and control, and give CEOs the incentive to increase shareholder wealth (Jensen and Meckling (1976)). Because shareholders are residual claimants, one way to increase the value of their stake is to increase the total firm value so that there is more left for shareholders after creditors claim their shares of firm assets. Managers can do so by capitalizing on profitable investment opportunities and extracting less private benefits of control in terms of shirking and perquisite consumption. This incentive, which we term as the "mean" effect of stock and stock options, will benefit not only shareholders but also debtholders, since the probability of a firm defaulting on its debt obligations is lower now that there is a bigger "pie". An efficient public debt market should be able to recognize the "mean" effect of stock and stock options and demand a lower credit risk premium on a firm's bond offering if the firm's CEO holds more stock and stock options.

CEO stock and stock option ownership can reduce a firm's cost of debt through a second channel. CEOs' holdings of equity-related claims represent personal wealth invested in their own firms. Prior studies such as Amihud and Lev (1981) and Lambert, Larcker, and Verrechia (1991) suggest that CEOs are risk averse because they can not hold a diversified asset portfolio due to their firm-specific human capital and restrictions on divesting stock and stock options they receive as compensation. Larger stock and stock option positions could make a CEO more reluctant to take risk by further straining the diversification of her portfolio. In isolation, this "risk-aversion" effect is welcomed by debtholders, but may not be in the best interest of shareholders. As a result, a firm whose CEO holds more stock and stock options will be able to fetch a higher valuation for its bond offerings and enjoy a lower cost of debt.

On the other hand, all is not well for debtholders with respect to CEO equity ownership. As we mentioned earlier, responding to the convexity embedded in the payoff structures of stock and especially stock options, a CEO is likely to increase firm risk through her choice of financial policy and investment activity. The risk-taking incentive, which we term as the "variance" effect, is harmful to debtholders. This is especially true if the CEO undertakes projects that are not only highly risky, but also of negative NPV (Galai and Masulis (1976) and Jensen and Meckling (1976)). Recognizing the adverse effect of higher risk on the value of their stakes, prospective creditors will demand a higher yield on a firm's debt offering if the firm's CEO has a larger ownership in stock and stock options.

Adding more wrinkles to the problem, stock and stock options differ notably in the aforementioned effects. Specifically, stock has higher value sensitivity to stock price than stock option,[3] so the "mean" effect of stock ownership is stronger than that of stock option ownership. However, the "variance" effect of stock option is stronger than that of stock, because the payoff structure of stock option is more convex (see e.g., Haugen and Senbet (1981), Smith and Stulz (1985), and Guay (1999)).[4] Therefore, debtholders should be more concerned about a CEO's stock option ownership than her stock holdings. Along the same line of reasoning, the ability of stock options to provide risk-taking incentives is not uniform and very much depends on the options' convexity, with at-the-money options having the most convex payoff structures and deep-in-the-money or deep-out-of-the-money options having the least convex ones. Therefore, a CEO holding options with little convexity pose much less a threat to bondholders than a CEO holding options with highly convex payoff structures.

In light of the above differences, we choose to differentiate between stock and stock options and separately analyze their effects on the cost of debt financing. We also explicitly take into account the heterogeneity in convexity among stock options by creating a multiplicative interaction term between a CEO's stock option ownership and a convexity measure of her option holdings. In a sample of 2467 straight debt offerings from 1993 to 2002, we find that credit rating

[3] The value sensitivity of stock to stock price is equal to one, while the value sensitivity of stock option to stock price, albeit always positive, never exceeds one and reaches one only asymptotically.
[4] Guay (1999) shows that for most firms, stock when considered as a call option written on total firm value is deep in the money and thus has very little convexity. In contrast, most stock options are granted at the money and gradually move into or out of the money depending on subsequent stock price performance.

agencies and investors in the public debt market do anticipate the consequences of managerial equity incentives and rationally rate and price a firm's debt claims.

For stock, we find that bonds receive better credit ratings and offer lower yield spreads when issued by firms whose CEOs hold *higher* percentage ownership of stock. Our interpretation is that to the prospective bondholders, the "mean" and "risk-aversion" effects of stock ownership outweigh its "variance" effect, resulting in lower costs of debt.

For stock options, our results indicate that bonds receive better credit ratings when issued by firms whose CEOs hold *lower* percentage ownership of stock options. The evidence regarding the effect of CEO stock option ownership on yield spread is more complicated and highlights the importance of differentiating among stock options based on the convexity of their payoff structures. Specifically, yield spread is increasing in CEO stock option ownership if the options held by the CEO have very convex payoff structures; the positive relation weakens as the stock options' convexity decreases, and eventually becomes negative when the options' payoff structure is close to linear, i.e., when stock options essentially become stock.[5] Therefore, it appears that for options with highly convex payoff structures, the "variance" effect dominates the "mean" effect and the "risk-aversion" effect, increasing the cost of debt, while for options with little convexity, the reverse is true, reinforcing our earlier finding that CEO stock ownership lowers a firm's cost of debt.

As another piece of evidence suggestive of the risk-taking incentives from stock options, we find that the positive (negative) effect of CEO stock option ownership on yield spread is larger (smaller) in magnitude the more volatile the issuing firms are. In other words, bondholders at riskier firms are more worried about the risk-taking incentives from stock options and thus demand higher yield spreads to compensate for the extra risk of financial distress.

[5] The most salient feature distinguishing stock options from stock is the convexity of stock options' payoff structure.

We make three contributions to the literature. First, we identify a potential cost of using stock options to compensate CEOs, i.e., a higher cost of debt manifested as poor bond ratings and higher yield spreads, and thus add to a growing literature that explores possible adverse consequences of equity-based compensation.[6] An implication that one can draw from our study is that the optimal design of option compensation is a delicate balancing act involving a trade-off between the benefits and costs of stock options. Second, we empirically establish that the ability of stock options to provide risk-taking incentives comes from convexity and that stock options without convexity are just like stock. Third, by focusing on bondholders, we provide an affirmative answer to a relatively under-explored question: whether managerial equity incentives affect the welfare of firms' other stakeholders and whether these parties are able to recognize the potential consequences and react in a rational manner.

Several recent papers investigate the relationship between a firm's ownership structure and its cost of debt. Anderson, Mansi, and Reeb (2003a) find that founding-family ownership on average reduces a firm's cost of debt. More related to our study are Anderson, Mansi, and Reeb (2003b) and Ortiz-Molina (2005). Similar to us, Anderson et al. (2003b) find that CEO stock ownership reduces a firm's cost of debt, but they do not consider CEO stock option ownership, which experienced rapid growth during the 1990s, provides drastically different incentives than stock ownership does, and as we show in this paper, has significant impact on bond rating and yield spread.[7] Ortiz-Molina (2005) find that CEOs' stock ownership and stock option ownership

[6] Several papers present evidence that stock and stock option holdings induce CEOs to manipulate corporate earnings to boost market valuations and benefit themselves by selling shares or exercising options at a high stock price. For instance, Cheng and Warfield (2004) and Bergstresser and Philippon (2004) both show that CEOs with more stock and stock option holdings engage in more aggressive earning management through discretionary accruals. On a more dramatic scale, Burns and Kedia (2004) find that CEOs holding more stock options are more likely to commit accounting fraud that requires future restatement.

[7] There are two alternative measures of cost of debt. One is the at-issue yield spread of a firm's bond offering (as used in Bhojraj and Sengupta (2002) and this paper), and the other is the average yield spread on a firm's outstanding public debt obligations (as used in Anderson et al. (2003a, b)). We find the former more attractive primarily for the following reason. The market for a corporate bond is the most liquid at the offering and the longer the corporate bond has been outstanding, the less liquid its market is (Green and Odegaard (1997)). To the extent that liquidity facilitates efficient price discovery, we believe the at-issue

both have positive effects on firms' cost of debt, but he treats all stock options the same. In contrast, we differentiate among stock options based on their convexity and find that the effect of CEO stock option ownership on yield spread is not uniform and varies from negative to positive depending on convexity. Moreover, we find evidence on both bond ratings and yield spreads that suggest CEO stock ownership reduces, rather than increases, a firm's cost of debt.

The rest of the paper is organized as follows. Section II describes sample construction and model specifications. Section III presents empirical results. Section IV concludes.

2. Sample construction and model specification

2.1. Data description

From the SDC Global New Issue Database we extract all non-convertible public debt offerings by U.S. public companies during the period of 1993 through 2002. We then require that each issuer have CEO stock and stock option ownership data available from the ExecuComp database for the year prior to the offering. All issuers must also have necessary financial statement information from COMPUSTAT and stock return data from CRSP. We exclude firms in the financial or utility industries from our study.[8] The final sample consists of 2467 straight debt offerings that on average raised more than $424 million. Table I presents the year and industry breakdown of our sample. Issuers come from 51 industries defined by 2-digit SIC codes. Firms in manufacturing, retail, and wholesale sectors account for about 70% of all offerings. There is no clear sign of clustering in terms of year distribution, with the largest number of issues (17.67% of the total sample) occurring in year 1998.

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yield spread to be a more accurate measure of a firm's cost of debt. Focusing on new bond offerings also allows us to link bond rating to managerial equity incentives at the issue and to incorporate bond-specific characteristics into our analysis as determinants of bond rating and yield.

[8] Our results are not sensitive to the inclusion of utility firms.

Table 1.1. Year and industry breakdown of bond issues

The sample consists of 2467 straight debt offerings from 1993 to 2002 by firms from 51 industries defined by 2-digit SIC codes. Numbers in the parentheses are the percentage of the total sample that is represented by each industry or year cohort. Mean proceeds are denominated in millions of year-2002 dollars.

Industry	No. of issues	Mean proceeds	Issue year	No. of issues	Mean proceeds
SIC<1000	9 (0.36%)	361.525	1993	222 (9.00%)	375.309
999<SIC<2000	168 (6.81%)	314.372	1994	115 (4.66%)	281.002
1999<SIC<3000	774 (31.37%)	360.230	1995	208 (8.43%)	246.271
2999<SIC<4000	555 (22.50%)	412.356	1996	211 (8.55%)	463.946
3999<SIC<5000	312 (12.65%)	576.455	1997	313 (12.69%)	317.825
4999<SIC<6000	401 (16.25%)	418.691	1998	436 (17.67%)	321.012
5999<SIC<7000	0 (0%)	N/A	1999	260 (10.54%)	606.087
6999<SIC<8000	201 (8.15%)	538.524	2000	130 (5.27%)	508.489
7999<SIC<9000	37 (1.50%)	549.380	2001	270 (11.94%)	649.588
8999<SIC	10 (0.41%)	793.321	2002	302 (12.24%)	479.243
Total	2467	424.806	Total	2467	424.806

2.2. Model specification

2.2.1. Dependent variables

We analyze both the rating and the at-issue yield spread of bond offerings. Yield spread is defined as the yield on a corporate bond minus the yield on a maturity-matching treasury bond and denominated in basis points (bps). It has been widely used as a measure of a firm's cost of debt.[9] Prior to the offering, each bond receives a rating from credit rating agencies such as Moody's and Standard and Poor's. The rating plays a significant role in determining a bond's yield spread in that the better the rating, the lower the yield spread. Therefore, if CEO equity incentives affect a bond's rating, they will have a bearing on the issuer's borrowing cost, at least indirectly. Following Anderson et al. (2003a, b), we transform each bond's credit rating into a numerical value and include it as an explanatory variable in yield spread regressions. Specifically, Caa1, the worst Moody's rating in our sample, is assigned a value of 1, and Aaa, the best Moody's rating in our sample, is assigned a value of 17 (see Appendix A for more details).[10]

2.2.2. Explanatory variables

We compute a CEO's percentage ownership of stock (or stock options) as the number of common and restricted stock (or stock options) held by the CEO divided by the total number of shares outstanding. We also calculate the weighted-average convexity of the CEO's stock option portfolio, where the convexity of a call option is defined as the second derivative of option value to stock price and is denoted by *gamma* (see Appendix B for the mathematical expression of *gamma*). The payoff structure of a call option is the most convex when the option is at the money and least convex or most linear when the option is deep in the money or deep out of the money. Typically, a CEO's option portfolio is composed of options granted at different points in time with different characteristics. Ideally, to calculate the average convexity of the CEO's option

[9] See, e.g., Anderson et al. (2003a, b), Bhojraj and Sengupta (2003), and Datta et al. (1999).

[10] Results presented in the paper are based on Moody's ratings. We also repeat all the analyses using S&P's ratings or the average of Moody's and S&P's ratings, and the results do not change.

portfolio, we would like to have the terms, e.g., time to maturity and exercise price, of each option grant. However, *ExecuComp* provides such details only for options granted in the current fiscal year, and it does not break down the CEO's option portfolio grant by grant.[11] But it does furnish the aggregate exercise value for all options that are in the CEO's portfolio. Utilizing these pieces of information and the algorithm developed by Core and Guay (2002), we are able to estimate the average convexity of the CEO's option portfolio (see Appendix B for details). We then create a multiplicative interaction term between the CEO's stock option ownership and the average convexity of her option portfolio. We expect the interaction term to have a positive effect on yield spread and a negative effect on bond rating in that more convex stock options provide more risk-taking incentives.

We also control for other potential determinants of bond rating and yield spread, and categorize them into firm- and issue-specific characteristics. The first group comprises firm size, stock return volatility, Tobin's Q, return on assets (ROA), and leverage ratio, and in the second group we take into account the seniority, relative size, and years to maturity of a bond issue and whether an issue is a shelf takedown, has call/put provisions, and is associated with a sinking fund. Finally, we rely on year and industry dummy variables to capture any unobservable factors that are time or sector specific and affect a firm's borrowing cost.

We measure firm size by the book value of total assets. Larger firms tend to have more diversified revenue streams and thus are less likely to go bankrupt. Also, financial distress may be less costly for larger firms, if there is a fixed component in the bankruptcy cost. Therefore, we expect larger firms to enjoy lower borrowing cost. We use the logarithmic transformation of total assets to remove the right skewness in the original data.

We proxy for firm risk by the stock return volatility calculated using the monthly stock returns over the past 60 months ending in the year prior to the issue. We predict that firms with

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[11] *ExecuComp* merely differentiates between vested (exercisable) options and unvested (unexercisable) ones.

higher stock return volatility are more likely to fall into financial distress and thus have higher cost of debt. Leverage ratio, i.e., the book value of long-term and short-term debt divided by the book value of total assets, is another measure of a firm's riskiness and likelihood of default. Firms with higher leverage are more likely to experience financial distress and as a result, face higher borrowing cost.

Tobin's Q, defined as the market value of total assets divided by the book value of total assets, proxies for the profitability of investment opportunities available to a firm. Firms with higher Tobin's Q have more profitable investment opportunities and thus are likely to have better future performance, reducing the probability of default and the cost of debt. However, profitable investment opportunities could also be risky ones, and taking on these risky projects will increase firm risk and the cost of debt. In contrast, return on assets (ROA) is a measure of current performance. If bondholders extrapolate current performance into the future, firms with higher current ROA will enjoy lower cost of debt.

Relative issue size is equal to the proceeds from a bond issue divided by the issuer's book value of total assets prior to the issue. The larger the relative issue size, the larger the issue's positive impact on the firm's leverage and risk. Therefore, we predict that the yield spread of an issue is positively related to its relative size. The yield spread is also likely to be higher for bonds with longer maturity since the cumulative probability of default is increasing over time.

Compared to subordinated debt, bonds of senior status tend to have lower yield spread, since their holders will be among the first in line to put a claim on the issuer's assets in cases of financial distress or bankruptcy. We create a binary variable that is equal to 1 for subordinated debt and zero otherwise. Issuing firms are likely to have to offer higher yield spreads on bonds with call provisions since call provisions impose prepayment risk on bondholders yet provide flexibility that is valuable to the issuers. We create a binary variable that is equal to one for bonds that are callable and zero otherwise. Shelf-takedown offerings are likely to enjoy lower yield spreads, since firms can time these issues for attractive credit market conditions so as to take advantage of transitorily lower interest rates. The takedown dummy is equal to one for bonds that are shelf-registered and zero otherwise. We also construct a binary variable that is equal to one for putable bonds and zero otherwise. Since the put option is valuable to bondholders, we expect it to lower the yield spread. Some bonds are associated with sinking funds that will be used to retire part or all of the issue over time. We define a binary variable that is equal to one for bonds with sinking fund and zero otherwise. The presence of sinking funds increases the probability of repayment and thus should lower the borrowing cost. However, the last two features, i.e., the put option and the sinking fund provision, often come with bonds issued by riskier firms (Smith and Warner (1979)). Therefore, we might find that putable bonds and bonds with sinking funds carry higher yield spread.

Finally, we create year dummy variables to capture any time-series changes in term structure and bond market conditions. We also construct industry binary variables based on issuers' one-digit SIC codes to control for any unobservable industry-wide factors. In sum, the baseline regression equations for bond rating and yield spread are specified as follows:

$$\begin{aligned} Rating = {} & \alpha_0 + \alpha_1\, stkpct + \alpha_1\, optpct + \alpha_3\, optpct \times gamma + \alpha_4\, log(assets) + \alpha_5\, volatility \\ & + \alpha_6\, Tobinq + \alpha_7\, ROA + \alpha_8\, leverage + \alpha_9\, relativesize + \alpha_{10}\, YTOM \\ & + \alpha_{11}\, callable + \alpha_{12}\, putable + \alpha_{13}\, subordinated + \alpha_{14}\, sinkfund \\ & + \delta' \times \text{industry and year dummy variables} + u, \qquad (1) \end{aligned}$$

$$\begin{aligned} Yieldspread = {} & \beta_0 + \beta_1\, rating + \beta_2\, stkpct + \beta_3\, optpct + \beta_4\, optpct \times gamma + \beta_5\, log(assets) \\ & + \beta_6\, volatility + \beta_7\, Tobinq + \beta_8\, ROA + \beta_9\, leverage + \beta_{10}\, relativesize + \beta_{11}\, YTOM \\ & + \beta_{12}\, takedown + \beta_{13}\, callable + \beta_{14}\, putable + \beta_{15}\, subordinated + \beta_{16}\, sinkfund \\ & + \gamma' \times \text{industry and year dummy variables} + v, \qquad (2) \end{aligned}$$

where the definitions of variables are as described above and listed in Table II. Note that we do not include the *takedown* dummy in equation (1) since there is no compelling reason why it would matter to bond rating, although we expect it to affect yield spread through possible managerial market timing.[12]

3. Empirical results

In Table III we report the summary statistics of variables used in ensuing regression analyses. The average yield spread is about 122 bps and the median is 92 bps. There is very large variation in the yield spread with the standard deviation being 94 bps. The median bond rating is Moody's A3 with a numerical value of 11. Over three quarters of the bonds are of investment grade. The average CEO stock ownership is 1.282%, far greater than the median, 0.134%, and the 75th percentile, 0.469%, suggesting that a small number of CEOs hold sizable proportion of their firms. In contrast, CEO stock option ownership is much less skewed, with the mean, 0.668%, close to the midpoint of the median, 0.397%, and the 75th percentile, 0.89%. *Gamma*, the weighted-average convexity of a CEO's option portfolio, has a mean of 0.007 and a median of 0.005. For the average (median) issuer, the stock return volatility is 28.8% (27%), the Tobin's Q is 1.923 (1.576), the return on assets (ROA) is 16.5% (16.1%), and the leverage is 31.1% (30.6%). The relative issue size is 6% on average and 3.1% at the median. The average maturity is close to 13 years and the median is 10. Over 94% of all issues are shelf takedowns, 26.7% are callable, 7.9% are putable, 2.6% are subordinated debt, and 0.9% have sinking funds.

The correlation matrix in Table IV shows that yield spread is significantly and positively related to stock return volatility, leverage, and relative issue size, and significantly and negatively related to bond rating, firm size, Tobin's Q, and ROA. Bonds that are callable, putable, or associated with sinking fund and bonds of subordinated status carry higher yield spreads. Shelf-takedown offerings pay lower yield spreads. Of particular interest to us, yield spread appears to

[12] When we include the *takedown* dummy in equation (1), its coefficient estimate is indeed insignificant.

Table 1.2. Variable definitions

Variable name	Variable definition
Yieldspread	At-issue yield of a corporate bond minus the yield of a maturity-matching treasury bond, denominated in basis points (bps)
Rating	Numerical transformation of Moody's bond rating, ranging from 1 for Caa1, the worst Moody's rating in our sample, to 17 for Aaa, the best Moody's rating in our sample. See Appendix A for more details.
Stkpct	CEO percentage ownership of stock, defined as the number of common and restricted stock held by a CEO divided by the total number of shares outstanding.
Optpct	CEO percentage ownership of stock options, defined as the number of stock options held by a CEO divided by the total number of shares outstanding.
Gamma	The weighted-average convexity of a CEO's option portfolio, computed following the procedure detailed in Appendix B.
Log (assets)	Logarithmic transformation of the book value of total assets prior to bond offerings
Volatility	Annualized monthly stock return volatility over the past 60 month provided by *ExecuComp*; if missing, supplemented with annualized daily return volatility over the past fiscal year.
Tobinq	The market value of total assets divided by the book value of total assets, calculated using COMPUSTAT data as (item6-item60+item25*item199)/item6.
ROA	Earning before interest, tax, depreciation and amortization (EBITDA) over the book value of total assets, calculated as item13/item6.
Leverage	The book value of total debt divided by the book value of total assets, calculated as (item9+item34)/item6.
Relativesize	The proceeds from bond offerings divided by the book value of total assets at the end of the fiscal year prior to offerings.
YTOM	Years to maturity of bond offerings.
Takedown	A binary variable that equals 1 for shelf-takedown bond offerings and zero otherwise.
Callable	A binary variable that equals 1 for callable bonds and zero otherwise.
Putable	A binary variable that equals 1 for putable bonds and zero otherwise.
Subordinated	A binary variable that equals 1 for subordinated bonds and zero otherwise.
Sinkfund	A binary variable that equals 1 for bonds with sinking fund provisions and zero otherwise.
X/S	The average moneyness of a CEO's option portfolio, calculated as the option portfolio's average exercise price (X) divided by the fiscal year end stock price (S). *X/S*, which is bounded between 0 and 1, measures how much the option portfolio on average is in the money.

Table 1.3. Summary statistics

The sample consists of 2467 straight debt offerings from 1993 to 2002. Variables are defined as in Table II.

Variables	Mean	Std. Dev	Q1	Median	Q3
Yieldspread (bps)	122.431	94.127	65	92	149
Rating	10.884	2.794	9	11	13
Stkpct (%)	1.282	5.019	0.046	0.134	0.469
Optpct (%)	0.668	0.909	0.169	0.397	0.890
Gamma	0.007	0.008	0.002	0.005	0.009
Log (assets)	8.976	1.199	8.136	8.900	9.841
Volatility	0.288	0.095	0.222	0.270	0.335
Tobinq	1.923	1.104	1.270	1.576	2.184
ROA	0.165	0.064	0.121	0.161	0.202
Leverage	0.311	0.132	0.220	0.306	0.386
Relativesize	0.060	0.089	0.009	0.031	0.077
YTOM (years)	12.974	12.697	5	10	12
Takedown	0.944	0.230	1	1	1
Callable	0.267	0.443	0	0	1
Putable	0.079	0.270	0	0	0
Subordinated	0.026	0.158	0	0	0
Sinkfund	0.009	0.094	0	0	0

Table 1.4. Correlation Matrix

All variables are defined as in Table 1.2. Correlation coefficients underlined are significant at the 5% level and those in bold are significant at the 1% level.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) *Yieldspread*	1															
(2) *Rating*	**-.63**	1														
(3) *Stkpct*	**.15**	**-.17**	1													
(4) *Optpct*	**.24**	**-.31**	**.08**	1												
(5) *Log (assets)*	**-.28**	**.50**	**-.18**	**-.29**	1											
(6) *Volatility*	**.53**	**-.38**	**.27**	**.20**	**-.18**	1										
(7) *Tobinq*	**-.25**	**.34**	-.01	-.00	.04	**-.12**	1									
(8) *ROA*	**-.30**	**.43**	**-.06**	-.05	**-.09**	**-.11**	**.58**	1								
(9) *Leverage*	**.27**	**-.36**	**.10**	**.14**	.02	**.13**	**-.07**	**-.15**	1							
(10) *Relativesize*	**.33**	**-.43**	**.22**	**.17**	**-.48**	**.30**	.00	.02	**.08**	1						
(11) *YTOM*	-.03	**.08**	-.01	**-.09**	**.06**	**-.10**	-.04	-.02	**-.07**	-.02	1					
(12) *Takedown*	**-.20**	**.23**	-.04	**-.07**	**.21**	**-.15**	.05	.04	-.04	**-.22**	.05	1				
(13) *Callable*	**.19**	**-.09**	.04	.06	.03	**.12**	.04	-.03	**-.06**	**.17**	**.10**	**.10**	1			
(14) *Putable*	**.34**	**-.35**	**.08**	.06	**-.21**	**.22**	**-.14**	**-.16**	**.15**	**.23**	**-.10**	**-.28**	**-.11**	1		
(15) *Subordinated*	**.38**	**-.35**	**.07**	**.19**	**-.21**	**.21**	**-.08**	**-.09**	**.16**	**.24**	-.03	**-.27**	**-.06**	**.35**	1	
(16) *Sinkfund*	.04	-.04	.00	-.03	-.02	.03	-.02	**-.06**	.02	-.01	.03	.02	-.05	-.00	.02	1

be increasing in both stock ownership and stock option ownership. However, as any other results from univariate analysis, these relationships could be spurious. For example, the positive relation between yield spread and stock and stock option ownership could be simply due to the negative correlation between yield spread and firm size and the negative correlation between firm size and stock and stock option ownership. Therefore, we next resort to multiple regressions of bond ratings and yield spread for reliable inferences.

3.1. CEO equity incentives and bond rating

Since bond ratings are ordinal, we estimate equation (1) as an ordered probit model with 17 outcomes,[13] and report the regression results in Table V. We find that bond rating is increasing in CEO stock ownership and decreasing in CEO stock option ownership. This suggests that for stock the "mean" effect and the "risk aversion" effect dominate the "variance" effect, and that for stock options the "variance" effect dominates the "mean" effect and the "risk aversion" effect. The interaction term between stock option ownership and *gamma* has very little explanatory power, implying that credit rating agencies do not appear to recognize the heterogeneity among stock options in the ability to provide risk-taking incentives. We also find that bonds issued by larger firms or firms with higher Tobin's Q or ROA are rated higher, and those issued by firms with higher stock return volatility or leverage are rated lower. Issue-specific attributes seem to factor into credit rating agencies' decisions as well. Relatively larger offerings are considered more risky, so are bonds that are callable, putable, or subordinated. A little surprising is that bonds of longer maturity tend to receive better ratings. This could be because only creditworthy borrowers are able to sell longer-term bonds in the public debt market. To the extent that bond features are endogenous, we remove them as regressors and notice little change in the coefficient estimates of CEO stock and stock option ownership (see the 3rd column).

[13] Rating Caa1 is the lowest outcome and rating Aaa is the highest outcome.

Table 1.5. Determinants of bond ratings

The dependent variable in this table is the numerical transformation of each bond's Moody's rating. All variables are defined as in Table 1.2. [a], [b], and [c] denotes statistical significance at the 1%, 5%, and 10% level, respectively. Coefficient estimates of the intercept and year and industry dummy variables are suppressed for brevity. Two-sided p-values are based on the Huber/White/sandwich estimator of standard errors.

Independent variables	Coefficient estimates (p-values)		
Stkpct	0.019[b] (0.012)	0.019[b] (0.012)	0.016[b] (0.039)
Optpct	-0.122[a] (0.005)	-0.121[a] (0.002)	-0.134[a] (0.000)
Optpct × Gamma	0.235 (0.935)		
Log (assets)	0.477[a] (0.000)	0.477[a] (0.000)	0.551[a] (0.000)
Volatility	-4.101[a] (0.000)	-4.101[a] (0.000)	-4.546[a] (0.000)
Tobinq	0.146[a] (0.000)	0.146[a] (0.000)	0.113[a] (0.001)
ROA	7.548[a] (0.000)	7.548[a] (0.000)	8.072[a] (0.000)
Leverage	-3.003[a] (0.000)	-3.002[a] (0.000)	-3.043[a] (0.000)
Relativesize	-1.935[a] (0.000)	-1.934[a] (0.000)	
YTOM	0.009[a] (0.000)	0.007[a] (0.000)	
Callable	-0.468[a] (0.000)	-0.468[a] (0.000)	
Putable	-0.348[a] (0.000)	-0.348[a] (0.000)	
Subordinated	-1.291[a] (0.000)	-1.291[a] (0.000)	
Sinkfund	-0.240 (0.277)	-0.241 (0.276)	
Pseudo-R^2	22.99%	22.99%	20.84%
Model's p-value	0.000	0.000	0.000
Number of observations	2467	2467	2467

3.2. CEO equity incentives and yield spread

3.2.1. Baseline model regressions

The first two columns of Table VI present the OLS regression results of equation (2), which highlight the importance of differentiating among stock options based on the convexity of their payoff structures. When we fail to do so as in the first column, we find that CEO stock ownership has a significantly negative effect on yield spread while the effect of stock option ownership is not statistically significant. However, when we take into account the convexity of each CEO's stock option portfolio as in the second column, we find that stock option ownership itself has a significant, negative coefficient and the interaction term between stock option ownership and *gamma* has a significant, positive coefficient, implying that the effect of stock option ownership on yield spread is increasing in the convexity of the option portfolio. Specifically, for options with little convexity, the "variance" effect is close to zero and the "mean" effect and "risk-aversion" effect become dominant, reducing the probability of default and the cost of debt.[14] Once *gamma* is greater than 0.005 (=4.168/806.621), however, the effect of option ownership on yield spread becomes positive and grows larger in magnitude the more convex the options' payoff structures are.

Yield spread is also significantly related to many other explanatory variables. Bonds issued by larger firms, firms with higher Tobin's Q, or firms with higher ROA carry lower yield spreads, while those issued by firms with higher stock return volatility offer higher yield spreads. Yield spreads are higher for relatively larger issues and issues of longer maturity. Issuing firms pay lower yield spreads on shelf-takedown offerings. Bonds that are callable, putable, and subordinated all offer higher yield spreads. Particularly worth noting is that bond rating has a

[14] To compare the economic significance of the negative effects of *stkpct* and (un-interacted) o*ptpct*, we calculate the changes in yield spread in response to one standard deviation change in the two variables, respectively. We find that the effect of (un-interacted) o*ptpct* on yield spread is only about twice as large as that of *stkpct*, despite the fact that the magnitude of *optpct*'s coefficient is about 10 times greater than that of *stkpct*'s coefficient (see the second column of Table V). This is because the standard deviation of *stkpct* is 5 times the standard deviation of *optpct*.

Table 1.6. Determinants of yield spreads

The dependent variable in this table is the yield spread to benchmark. All variables are defined as in Table 1.2. [a], [b], and [c] denotes statistical significance at the 1%, 5%, and 10% level, respectively. Coefficient estimates of the intercept and year and industry dummy variables are suppressed for brevity. Two-sided p-values are based on the Huber/White/sandwich estimator of standard errors.

Independent variables	Coefficient estimates (p-values)				
Rating	-15.620[a] (0.000)	-15.681[a] (0.000)	-16.071[a] (0.000)	-15.638[a] (0.000)	-16.010[a] (0.000)
Stkpct	-0.536[b] (0.028)	-0.437[c] (0.073)	-0.481[b] (0.046)	-0.497[b] (0.040)	-0.542[b] (0.026)
Optpct	0.659 (0.641)	-4.168[b] (0.012)	-20.735[a] (0.000)	-10.409[a] (0.004)	-25.059[a] (0.000)
Optpct × Gamma		806.621[a] (0.000)	788.286[a] (0.000)		
Optpct × X/S				16.474[a] (0.003)	14.546[b] (0.014)
Optpct × Volatility			42.959[a] (0.001)		41.077[a] (0.003)
Log (assets)	-3.294[b] (0.022)	-2.626[c] (0.070)	-3.057[b] (0.034)	-3.029[b] (0.037)	-3.457[b] (0.017)
Volatility	162.870[a] (0.000)	164.509[a] (0.000)	129.587[a] (0.000)	167.528[a] (0.000)	133.626[a] (0.000)
Tobinq	-5.748[a] (0.000)	-4.783[a] (0.000)	-4.737[a] (0.000)	-5.061[a] (0.000)	-5.077[a] (0.000)
ROA	-61.396[b] (0.014)	-59.190[b] (0.018)	-55.408[b] (0.027)	-61.149[b] (0.015)	-57.513[b] (0.022)
Leverage	5.418 (0.636)	-0.727 (0.949)	-1.112 (0.923)	2.275 (0.845)	2.141 (0.855)
Relativesize	42.692[b] (0.029)	39.717[b] (0.041)	37.206[c] (0.059)	45.079[b] (0.025)	42.334[b] (0.037)
YTOM	0.827[a] (0.000)	0.830[a] (0.000)	0.824[a] (0.000)	0.823[a] (0.000)	0.818[a] (0.000)
Takedown	-24.215[a] (0.000)	-22.105[a] (0.001)	-20.764[a] (0.003)	-23.806[a] (0.001)	-22.526[a] (0.001)
Callable	2.063 (0.505)	2.116 (0.494)	1.891 (0.541)	2.375 (0.442)	2.125 (0.493)
Putable	34.657[a] (0.000)	33.598[a] (0.000)	32.584[a] (0.000)	34.601[a] (0.000)	33.614[a] (0.000)
Subordinated	79.607[a] (0.000)	76.642[a] (0.000)	74.666[a] (0.000)	79.663[a] (0.000)	77.703[a] (0.000)
Sinkfund	23.709 (0.132)	25.344 (0.102)	26.654[c] (0.087)	24.835 (0.112)	25.991[c] (0.099)
Adjusted-R^2	66.35%	66.85%	67.04%	66.52%	66.69%
Number of observations	2467	2467	2467	2467	2467

significantly negative effect on yield spread despite the presence of all the explanatory variables used in the earlier bond rating regressions. It appears that credit rating agencies rely on more than observable firm and issue characteristics to rate a bond.

We conduct further analysis to investigate whether the impact of CEO stock option ownership on yield spread depends on a firm's current volatility level. It is possible that bondholders of riskier firms are more concerned about the risk-increasing incentives provided by CEO stock option holdings, since any additional risk taking may drive these firms into financial distress. However, it is also possible that there is not much room for risk taking at these riskier firms and thus bondholders worry less about stock options. The results in the third column of Table VI support the former conjecture in that the coefficient estimate of the interaction term between CEO stock option ownership and volatility is significantly positive.

3.2.2. An alternative to gamma

Instead of using *gamma* to proxy for the ability of stock options to provide risk-taking incentives, we construct a more crude measure, i.e., the average moneyness of an option portfolio, following a much easier algorithm than what Core and Guay (2002) propose. For each CEO's option portfolio, we first divide the aggregate exercise value by the number of options to obtain the average exercise value per option. We then subtract the average exercise value per option, which is non-negative, from the fiscal-year-end stock price, denoted as *S*, to arrive at an estimate of the option portfolio's average exercise price, denoted as *X*. *X/S*, bounded between 0 and 1, is an inverse measure of how much the option portfolio is in the money. The sample mean (median) of *X/S* is 0.67 (0.75), so the average (median) option portfolio is 50% (33%) in the money.[15] Note that due to the data limitations of *ExecuComp*, any option portfolio that on average is at the money or out of the money has *X/S* set equal to 1. However, given that most of our sample period overlaps with the bull market in the 1990s, the incidence that a CEO's option portfolio is on

[15] 50% ≈ (1/0.67)-1 and 33% ≈ (1/0.75)-1.

average out of the money should be relatively infrequent, and even more so if we take into account the practice of option repricing.[16]

We replace the interaction term between CEO stock option ownership and *gamma* in equation (2) with a new interaction term between CEO stock option ownership and *X/S*. Since an option's convexity is the highest at the money (i.e., when *X/S*=1) and decreases asymptotically to zero when it is deep in the money (i.e., when *X/S*≈0), an option portfolio that is on average at the money provides more risk-taking incentives than one that is on average more in the money. Therefore, we expect a positive coefficient for the newly constructed interaction term in yield spread regressions.

We re-estimate equation (2) with the new interaction term and report the results in the fourth and fifth columns of Table VI. Again, we find that CEO option ownership itself has a significantly negative coefficient and the interaction term has a significantly positive coefficient, suggesting that CEO ownership of deep-in-the-money options (*X/S*≈0) reduces the cost of debt while CEO ownership of at-the-money options (*X/S*=1) increases the cost of debt. Take the coefficient estimates in the fourth column as an example. It appears that CEO option ownership has a positive effect on yield spread as long as the options she holds are less than 60% in the money and the effect becomes negative once the options are over 60% in the money.[17] The coefficient estimates of other independent variables are all similar to those in the first three columns.

3.3. Robustness checks

3.3.1. Replacing bond rating with its residual

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[16] Because of the recent economic downturn, CEOs at firms that issue bonds in 2001 and especially 2002 may be more likely to have underwater options. Our results are robust to the exclusion of debt offerings in these two years.

[17] 60% ≈ 16.474/10.409 – 1.

As we have shown in Table V, credit rating agencies to some extent have incorporated firm characteristics (including CEO equity incentives) and issue features into bond ratings. Therefore, the presence of bond rating itself in yield spread regressions could take away some of the explanatory power of the independent variables in equation (2). The approach we take to address this problem is similar to the one used by Anderson et al. and Datta et al. (1999). We estimate equation (1) in an OLS regression framework and obtain the residuals of bond ratings. We then re-estimate equation (2) with bond ratings replaced with their residuals. Results from the two steps (Table VII) generate the same inferences as those in Tables V and VI. The only notable difference is that the coefficient estimates of many explanatory variables in yield spread regressions are now larger in magnitude and statistically more significant.

3.3.2. Interacting CEO stock ownership with leverage

The negative coefficients of CEO stock ownership in the yield-spread regressions in Tables VI suggest that the "mean" and "risk-aversion" effects of stock ownership dominate the "variance" effect. However, the "variance" effect is heterogeneous among stocks, since when stock is considered as a call option written on total firm value, its moneyness and ability to provide risk-taking incentives are functions of firm leverage. More specifically, the higher the leverage, the less in the money the stock and the stronger the stock's "variance" effect. Therefore, we expect the negative effect of stock ownership on yield spread to decrease in magnitude as firm leverage rises.

To examine this possibility, we include an interaction term between CEO stock ownership and firm leverage as an additional regressor in yield spread regressions, and we expect it to have a positive coefficient. The coefficient estimates in the first column of Table VIII confirm our conjecture.

We also employ a piece-wise regression framework to investigate how the effect of CEO stock ownership on yield spread varies with leverage. We break the whole sample into four

Table 1.7. Replacing bond ratings with their residuals

The dependent variable in this table is the yield spread to benchmark. All variables are defined as in Table 1.2. [a], [b], and [c] denotes statistical significance at the 1%, 5%, and 10% level, respectively. Coefficient estimates of the intercept and year and industry dummy variables are suppressed for brevity. Two-sided p-values are based on the Huber/White/sandwich estimator of standard errors.

Independent variables	Coefficient estimates (p-values)		
	OLS regression of rating	Yield spread regressions	
Rating_residual		-16.071[a] (0.000)	-16.010[a] (0.000)
Stkpct	0.028[b] (0.020)	-0.927[a] (0.000)	-0.986[a] (0.000)
Optpct	-0.200[a] (0.001)	-17.526[a] (0.000)	-21.862[a] (0.001)
Optpct × Gamma		788.286[a] (0.000)	
Optpct × X/S			14.546[b] (0.014)
Optpct × Volatility		42.959[a] (0.001)	41.077[a] (0.003)
Log (assets)	0.736[a] (0.000)	-14.891[a] (0.000)	-15.246[a] (0.000)
Volatility	-6.274[a] (0.000)	230.427[a] (0.000)	234.083[a] (0.000)
Tobinq	0.202[a] (0.000)	-7.991[a] (0.000)	-8.319[a] (0.000)
ROA	12.055[a] (0.000)	-249.152[a] (0.000)	-250.522[a] (0.000)
Leverage	-4.692[a] (0.000)	74.298[a] (0.000)	77.266[a] (0.000)
Relativesize	-2.864[a] (0.000)	83.237[a] (0.000)	88.190[a] (0.000)
YTOM	0.010[a] (0.000)	0.656[a] (0.000)	0.651[a] (0.000)
Takedown		-20.764[a] (0.003)	-22.527[a] (0.001)
Callable	-0.748[a] (0.000)	13.909[a] (0.000)	14.097[a] (0.000)
Putable	-0.551[a] (0.000)	41.444[a] (0.000)	42.441[a] (0.000)
Subordinated	-2.049[a] (0.000)	107.591[a] (0.000)	110.502[a] (0.000)
Sinkfund	-0.429 (0.250)	33.545[b] (0.031)	32.856[b] (0.036)
Adjusted-R^2	67.07%	67.04%	66.69%
Number of observations	2467	2467	2467

Table 1.8. Interacting CEO stock ownership with leverage

The dependent variable in this table is the yield spread to benchmark. All variables are defined as in Table 1.2. [a], [b], and [c] denotes statistical significance at the 1%, 5%, and 10% level, respectively. Two-sided p-values are based on the Huber/White/sandwich estimator of standard errors. Coefficient estimates of the intercept, firm- and issue- specific variables, and year and industry dummy variables are suppressed for brevity.

Independent variables	Coefficient estimates (p-values)	
Rating	-15.813[a] (0.000)	-15.681[a] (0.000)
Stkpct	-1.251[a] (0.001)	
Stkpct× Leverage	1.729[b] (0.032)	
Stkpct-quartile1 (lowest leverage)		-0.812[a] (0.010)
Stkpct-quartile2		-0.691 (0.492)
Stkpct-quartile3		-0.448 (0.473)
Stkpct-quartile4 (highest leverage)		-0.190 (0.578)
Optpct	-4.174[b] (0.012)	-4.230[b] (0.011)
Optpct × Gamma	808.351[a] (0.000)	810.697[a] (0.000)
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Adjusted-R^2	66.88%	66.83%
Number of observations	2467	2467

quartiles based on firm leverage and allow the coefficient estimate of CEO stock ownership to differ among the four quartiles. The regression results presented in the second column of Table VIII show that CEO stock ownership has a negative effect on yield spread in all four quartiles, but the effect is statistically significant only for the lowest-leverage quartile, again supporting our conjecture.

3.3.3. Alternative managerial equity incentive measures

As alternatives to the percentage ownerships used in our analysis, we also experiment with two dollar measures to characterize a CEO's incentives from her stock and stock option holdings. One measure, denoted as *delta*, is the sensitivity of the CEO's wealth to stock price and is computed as the change in dollar value of the CEO's entire stock and stock option portfolio per 1% change (percentage change) in her firm's stock price; the other measure, denoted as *vega*, is the sensitivity of the CEO's wealth to stock return volatility and is computed as the change in dollar value of the CEO's entire stock and stock option portfolio per 0.01 change (absolute, not percentage, change) in her firm's stock return volatility. We construct *delta* and *vega* following the algorithm developed by Core and Guay (2002) and take their logarithmic transformation to remove the skewness in the original data. We find (unreported) that *delta* has a negative effect on yield spread and that *vega* has a positive effect on yield spread. The first finding is consistent with the negative effects of CEO stock ownership and stock option ownership (un-interacted) on yield spread and the second is consistent with the positive effect of CEO stock option ownership interacted with convexity.

3.3.4. Controlling for the most recent option grants

Since most new option grants are made at the money and thus have high convexity, one reason that some CEOs hold higher-convexity option portfolios prior to debt offerings while others hold lower-convexity portfolios is that the former group received more option grants in the most recent fiscal year. Therefore, the positive effect on yield spread of CEO ownership of options with high convexity could be an artifact of the public debt market imposing higher costs of capital on firms that recently made larger option grants to their CEOs. We examine this possibility by controlling for the magnitude of option grants made by each issuer to its CEO in the fiscal year prior to its debt offering. To be consistent with the construction of stock ownership and option ownership, we scale the number of options received by each CEO in the most recent fiscal year by the number of common stock outstanding. We find that the magnitude of new option grants is not significantly related to a firm's cost of debt, either when it is included in the yield-spread regressions with other equity-ownership variables or when it is the only ownership variable included. Its inclusion does not change any of our previous findings. Therefore, our results do not seem to be driven by new option grants recently made by issuers to their CEOs.

3.3.5. Other sensitivity tests

To capture any non-linear effect of bond rating on yield spread, we replace the bond rating variable that ranges from 1 to 17 with 16 indicator variables in the yield spread regressions. Our results on the effects of CEO stock and stock option ownership do not change.

Yield spread, by definition, should be bounded from below at zero, since no corporate bonds have lower probability of default than treasury bonds of matching maturity. We obtain essentially the same results (unreported) when we re-estimate the yield spread regressions in a one-sided Tobit framework.

To more adequately control for the risk of financial distress at issuing firms, we construct the Altman's Z-score for each issuer and include it as an additional explanatory variable in yield spread regressions.[18] We find (unreported) that the Z-score has a significantly negative coefficient

[18] The Altman's Z-score is equal to 3.3×item178/item6 + 1.2×(item4-item5)/item6 + item12/item6 + 0.6×item25*item199/(item9+item34) + 1.4×item36/item6; the higher a firm's Z-score is, the less likely the firm is to experience financial distress. One hundred and fifty-nine bond offerings do not have necessary

and that the results on CEO stock and stock option ownership are qualitatively the same as and statistically more significant than those in Table VI.

Our results are also robust to controlling for firm age, asset tangibility, stock price run-up over the 6 months prior to each debt offering, leverage change in the year prior to each debt offering, and CEO tenure. None of these variables has a significant effect on yield spread. Our results continue to hold when we exclude issuing firms from high-tech industries defined by Loughran and Ritter (2004). Finally, we adjust all our variables for industry medians (based on 2-digit SIC codes) and obtain very similar results.

We would also like to control for CEO wealth as a proxy for risk aversion and CEO age. However, CEO age is missing for more than half of our observations, and we do not have information on CEO wealth. Hall and Murphy (2002, p. 11) point out that "top executives of publicly traded U.S. firms are required to disclose their holdings of company securities, but are not required to disclose other assets in their portfolio. Therefore, we cannot calculate the actual percentage of wealth tied to company stock for any executives, and we are not aware of any broad survey information that might yield evidence on this question". In fact, Becker (2005) is the only paper in the literature that has reliable data on CEO wealth, which he obtained from Swedish tax filings.

4. Conclusion

We investigate whether managerial incentives from stock and stock options affect firms' cost of debt using a large sample of public debt offerings from 1993 to 2002. We differentiate between the two types of security ownership and separately examine their effects on the ratings and at-issue yield spreads of corporate bonds. We find that bond ratings are positively related to CEO stock ownership and negatively related to CEO stock option ownership, suggesting that

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information from COMPUSTAT to compute the Z-score and are thus dropped form our sample when Z-score is included in the regression.

credit rating agencies view bonds issued by firms whose CEOs hold more stock (or stock options) to be safer (or riskier). For yield spreads, our results indicate that CEO stock ownership reduces bond yields, echoing its positive effect on bond ratings and implying once again that higher CEO stock ownership results in a lower cost of debt. The effect of CEO stock option ownership on yield spread, however, is more intricate, and it depends critically on the convexity of the options' payoff structure. Specifically, yield spread increases with CEO stock option ownership if the option holdings on average have a highly convex payoff structure, but as the payoff structure becomes less convex or even close to linear, the positive relation becomes weaker and eventually turns negative. This lends strong support to the argument that it is the convexity of stock options' payoff structure that provides CEOs with risk-taking incentives and distinguishes stock options from stock. Overall, our evidence suggests that credit rating agencies and the public debt market do take into account the potential impact of CEO equity incentives on debtholder wealth when they rate and price corporate bonds. To the extent that the public debt market is able to recognize that the ability of stock options to provide risk-taking incentives is an increasing function of the convexity of their payoff structures while credit rating agencies perceive all stock options as the same, the former seems to be more efficient in deciphering the incentives from CEO stock and stock option holdings.

Another important implication from our results is that despite all the benefits, compensating CEOs with stock and especially stock options could also bring real costs to shareholders, one of which, as we document, is a higher cost of debt capital as a result of potential debtholders' concern over the risk-taking incentives from stock options. Viewed in this light, the paper contributes to a growing literature that explores adverse consequences of equity-based compensation to shareholders.

Appendix 1.1. Numerical conversion of bond ratings

The table below provides the numerical conversion procedure for Moody's and S&P's bond ratings that appear in our sample. Bonds with ratings above the dotted line are of investment grade.

Conversion number	Moody's rating	S&P's rating
17	Aaa	AAA
16	Aa1	AA+
15	Aa2	AA
14	Aa3	AA-
13	A1	A+
12	A2	A
11	A3	A-
10	Baa1	BBB+
9	Baa2	BBB
8	Baa3	BBB-
7	Ba1	BB+
6	Ba2	BB
5	Ba3	BB-
4	B1	B+
3	B2	B
2	B3	B-
1	Caa1	CCC+

Appendix 1.2. Computation of the convexity of a portfolio of stock options

The convexity of a stock option is the second derivative of option value (c) to stock price (S), i.e., $\partial^2 c/\partial S^2$, and is denoted by the Greek letter *gamma*. The value of a stock option is given by the Black-Scholes option pricing formula (Black and Scholes (1973)) for valuing European call options, as modified by Merton (1973) to account for dividend payouts.

$$c = Se^{-dT}N(Z) - Xe^{-rT}N(Z-\sigma T^{1/2}) \qquad (1)$$

$$gamma = \partial^2 c/\partial S^2 = e^{-dT}n(Z)/(S\sigma T^{1/2}) \qquad (2)$$

where

$Z = (\ln(S/X) + T(r-d+\sigma^2/2))/(\sigma T^{1/2})$,

S = price of the underlying stock,

X = exercise price of the option,

T = time to maturity of the option in years,

r = natural logarithm of risk-free interest rate,

d = natural logarithm of expected dividend yield on the underlying stock over the life of the option,

σ = expected annualized stock-return volatility over the life of the option,

N(.) = c.d.f. of standard normal distribution, and

n(.) = p.d.f. of standard normal distribution.

Following Core and Guay (2002), we decompose a CEO's option portfolio into three sub-portfolios: (i) newly granted options, (ii) previously granted and exercisable options, and (iii) previously granted and unexercisable options. *ExecuComp* provides such details as size, exercise price, and time to maturity for each of the current year's option grants, but for previously granted options (exercisable or unexercisable), it merely gives aggregate size and realizable value (the potential gains from exercising all options at the fiscal year end stock price). Core and Guay (2002) develop an algorithm to estimate the exercise price and time to maturity for these options so that the formulae given above can be applied.

1. We directly apply the above formulae to calculate the convexity of the options in each current-year option grant. The convexity of the portfolio of newly granted options is the weighted-average convexity of all current-year grants with the weight being the number of options in each grant.

2. After removing newly granted options, if any, from the fiscal-year-end option portfolio, we obtain a portfolio of previously granted options. Some of these options are exercisable (vested) and others are un-exercisable (unvested). We compute the convexity separately for the portfolio of exercisable options and the portfolio of un-exercisable options.

<u>Exercise price</u>: for each portfolio, we first divide the aggregate realizable value by the number of options in the portfolio, which gives the average of (stock price – exercise price). We then subtract this number from the stock price to arrive at the average exercise price.

<u>Time to maturity</u>: for un-exercisable options, we set the average time to maturity equal to one year less than the time to maturity of the current year's options grants, or equal to 9 years if no grant was made in the current year; for exercisable options, we set the average time to maturity as four years less than the time to maturity of the current year's options grants, or 6 years if no grant was made in the current year.

Using the imputed average exercise price and average time to maturity, we can apply the above formulae to calculate the convexity of the options in the two portfolios of previously granted options.

3. The convexity of the entire option portfolio is defined as the weighted-average convexity of (i) newly granted options, (ii) previously granted, exercisable options, and (iii) previously granted, unexercisable options, with the weight being the number of options in each sub-portfolio.

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CHAPTER II

THE COST OF EQUITY-BASED COMPENSATION TO THE SHAREHOLDERS: EVIDENCE FROM FIRMS' SECURITIES ISSUE DECISIONS

1. Introduction

The 1990s witnessed an explosive use of equity-based compensation (EBC hereafter) in the forms of restricted stock and stock options in executive's pay packages [see, e.g., Yermack (1995) and Hall and Liebman (1998)]. One of the widely-accepted economic justifications for this phenomenon is that EBC can potentially align the interests of the shareholders and the managers and thus mitigate the agency problem inherent in large public corporations characterized by the separation of ownership and control. Following Morck, Shleifer, and Vishny (1989), many researchers have presented evidence supporting this claim [see, e.g., McConnell and Servaes (1990), Bliss and Rosen (2001), and Datta, Iskandar-Datta, and Raman (2001)].[19]

However, more equity-based compensation does not always lead to better managerial decisions or higher shareholder wealth. Executives holding too many equity-related claims in their wealth portfolios may develop symptoms of managerial myopia and even display certain perverse behavior that is harmful to shareholders. For example, the popular press and the regulators hold stock options at least partially accountable for some of the recent high-profile corporate scandals. Academic studies emerge with evidence that stock and stock option holdings induce CEOs to manipulate corporate earnings to boost market valuations and benefit themselves by selling shares or exercising options at a high stock price. For instance, Cheng and Warfield (2002) and Bergstresser and Philippon (2003) both show that CEOs with more stock and stock option holdings engage in more aggressive earning management through discretionary accruals.

[19] However, controversy remains on this issue. For example, Himmelberg, Hubbard, and Palia (1999) show that the relationship between managerial ownership and firm performance disappears in models controlling for firm fixed effects. But Zhou (2001) casts doubt on the appropriateness of using firm fixed effect models in this context because of the slow-changing nature of the ownership structure.

On a more dramatic scale, Burns and Kedia (2004) find that CEOs holding more stock options are more likely to commit accounting fraud that requires future restatement. The stock of firms that manage their earnings aggressively ends up losing more value in the long run (Chan, Chan, Jegadeesh, and Lakonishok (2001)).

In this paper, we focus on a scenario where EBC creates an agency problem between managers and shareholders. Specifically, we investigate how CEO incentives from stock and stock option holdings influence firms' financing policy. Our findings are consistent with the hypothesis that in an attempt to protect or enhance their personal wealth, CEOs with more stock and especially stock options favor debt over equity as a capital-raising vehicle, even if equity offerings are more beneficial to shareholders. As we will explain in more detail in the next section, there are at least two reasons why managers dislike equity financing and prefer debt financing. First, seasoned equity offerings on average have a depressing effect on issuers' stock prices while the stock market's reaction to the announcements of straight debt offerings is only insignificantly negative.[20] The significant drop in stock price associated with equity offerings represents a substantial cost to CEOs holding a large number of stock and stock options.[21] Second, relative to equity financing, debt financing increases firms' leverage ratio. To the extent that a firm's leverage translates positively into its stock return volatility (see, e.g., Coles, Daniel, and Naveen (2004)), CEOs with large stock and stock option holdings would prefer debt

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[20] See Asquith and Mullins (1986), Dann and Mikkelson (1984), Masulis and Korwar (1986), and Mikkelson and Partch (1986)) for evidence on the announcement effect of seasoned equity offerings, and Eckbo (1986) for evidence on the announcement effect of straight debt offerings.

[21] Several studies have shown that both the debt issuers and the equity issuers experience significant long-run underperformance over the 3 or 5 -year period after issuance, but the magnitude of the underperformance differs between the two types of issuers. Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995) both find average underperformance of well over 30% in the five years following the seasoned equity offerings. On the other hand, Spiess and Affleck-Graves (1999) report that the straight debt issuers in their sample on average underperform a size and book-to-market matched sample by only 19% in the five years following the offering. Although there is no scientific evidence on the statistical significance of the difference in underperformance (30% vs. 19%), the economically more severe underperformance of equity issuers would make equity financing less desirable than debt financing to executives with more stock and stock option holdings. However, the literature on the long-run performance of security issuers is not settled. For example, Eckbo, Masulis, and Norli (2002) find no evidence of long-run underperformance among seasoned debt and equity issuers.

financing, since based on the option pricing formula in Black and Scholes (1973) the value of a stock option is increasing in the stock return volatility and the value of stock, which can be considered as a call option on the value of a firm, is increasing in firm risk.[22]

Drawing upon earlier studies including Core and Guay (1999, 2002), Guay (1999), Jensen and Murphy (1990), and Yermack (1995), we use two measures to characterize a CEO's incentives from stock and stock option ownership. One measure, denoted as *delta*, is the sensitivity of the CEO's wealth to stock price and is computed as the change in dollar value of the CEO's entire stock and stock option portfolio per 1% change (percentage change) in her firm's stock price; the other measure, denoted as *vega*, is the sensitivity of the CEO's wealth to stock return volatility and is computed as the change in dollar value of the CEO's entire stock and stock option portfolio per 0.01 change (absolute, not percentage, change) in her firm's stock return volatility. Controlling for other determinants of securities issue decisions, we find that firms whose CEOs have a higher *vega* are more likely to choose debt financing and that the relationship is both statistically and economically significant. However, CEOs' *delta* does not appear to affect firms' financing decisions. Since both stock and stock options contribute to *delta* while *vega* comes entirely from stock options in our empirical analysis, our findings suggest that it is the CEOs' stock option holdings that influence their preference between debt and equity.

Besides the private-benefits based hypothesis arguing that CEOs look after their own interests by favoring debt over equity, the positive effect of *vega* on the probability of debt offering is also consistent with an interest-alignment hypothesis proposed by Berger, Ofek, and Yermack (1997). They argue that entrenched CEOs prefer lower-than-optimal leverage because of the disciplinary effect of leverage. Stock option holdings mitigate the agency problem between managers and shareholders and better-aligned managers increase leverage to an optimal level. To

[22] As we will discuss later, the sensitivity of the value of a stock to firm risk is several orders of magnitude lower than the sensitivity of a stock option to stock return volatility, since when considered as a call option, the stocks of most firms are deep in the money and deep in the money options lose most of their sensitivity to volatility (Guay (1999)). Therefore, we ignore the stock component in calculating the sensitivity of CEO wealth to stock return volatility in our empirical exercises.

differentiate between these two competing explanations, we conduct two additional sets of tests. We first examine whether the effect of *vega* depends on whether a firm is under-levered or over-levered relative to its optimal leverage ratio. We find that CEOs with higher *vega* prefer debt financing regardless of their firms' leverage status, inconsistent with the prediction of the incentive-alignment hypothesis in Berger et al. We then investigate how the stock market reaction to the announcements of securities offerings is related to *vega*. Results from multivariate regressions show that the two-day cumulative abnormal return (CAR) around the announcement is significantly and negatively related to *vega*, again supportive of our conflict-of-interest conjecture. The market seems able to recognize the potential conflict of interest and reacts to the announcements of securities offerings accordingly.

Our study makes two major contributions to the literature. First, we add more dimensions to the agency theory in Jung, Kim, and Stulz (1996) that emphasizes the conflict of interest between shareholders and managers in explaining firms' choice between debt financing and equity financing. We provide concrete evidence on one possible source of the agency problem and what particular private benefits CEOs can extract by favoring one type of financing over the other. Second and more importantly, we identify another un-intended adverse consequence of giving large stock and option grants to top executives, in addition to fostering aggressive earning management and accounting fraud. Namely, CEOs may pursue suboptimal capital structures in order to increase the value of their stock option portfolios. Our findings lend support to the recent proposal that firms replace stock options with restricted stock.

The remainder of the paper is organized as follows. Section II develops the main hypotheses in greater details. Section III briefly reviews the related literature. Section IV discusses the sample and variable construction and presents the empirical results. Section V concludes.

2. Hypothesis development

For public companies, there are a number of ways to raise capital. For example, among other alternatives, firms can float seasoned equity in the stock market, issue debt in the bond market, secure a credit line or a loan agreement from their lending banks, or conduct private placement of equity or debt claims to certain types of investors. Following earlier studies such as Jung, Kim, and Stulz (1996), we focus on the offerings of common equity and straight debt in the public capital market, because they are much more visible than the other alternatives. We investigate how CEO equity incentives affect firms' choice between stock and debt financing. In light of the evidence that debt financing and equity financing have different impacts on stock price and stock return volatility, we argue that executive stock and stock option holdings, which are designed to mitigate the agency problem between shareholders and managers, generate a conflict of interest between the two parties in the context of firms' financing decisions. Specifically, we predict that CEOs with higher levels of equity incentives measured by *delta* or *vega* or both would prefer debt financing over equity financing, even if the latter were more beneficial to the shareholders.

We further develop implications from the conflict-of-interest hypothesis and an incentive-alignment hypothesis, which has the same prediction as the conflict-of-interest hypothesis regarding the impact of managerial equity incentives on firm financing decisions. The stark differences between the secondary predictions of these two conjectures allow us to provide more definitive evidence on the role played by managerial equity incentives.

2.1. Initial market reaction to the security issuance

As documented in the literature, the announcements of seasoned equity offerings are greeted unfavorably by the market with an average two-day abnormal return of around -3%, while the announcements of straight debt offerings only generate insignificantly negative market reactions (see, among others, Asquith and Mullins (1986), Dann and Mikkelson (1984), Eckbo (1986), Masulis and Korwar (1986), and Mikkelson and Partch (1986)). For CEOs with significant stock and stock option holdings, the 3% drop in stock price associated with equity offerings represents a substantial loss in the value of their wealth portfolios, a loss that they can easily avoid by issuing debt instead of equity. Stated formally, the first part of our hypothesis is:

H-1: ***The significantly negative market reactions to seasoned equity issuances and insignificant abnormal returns generated by debt issuances make CEOs holding high levels of equity incentives favor debt in raising new funds, ceteris paribus.***

2.2. Effect on firm risk and stock return volatility

In addition to the announcement effect, equity offerings and debt offerings also differ in their effects on firm leverage and equity risk. It is obvious that relative to equity offerings, debt offerings increase firm leverage. To the extent that higher leverage leads to higher stock return volatility (see, e.g., Coles et al (2004)), the value of CEOs' equity portfolios, especially the stock option component, increases (decreases) with debt (equity) offering, since the value of an option is an increasing function of stock return volatility.[23] Therefore, we predict that CEOs holding more stock options in their wealth portfolios are more inclined to choose debt financing. Stated formally, the second part of our hypothesis is:

H-2: ***The positive effect of debt offering on firm risk and stock return volatility makes it more desirable than equity offering to CEOs holding more equity incentives, stock options in particular, ceteris paribus.***

2.3. Conflict of interest or better incentive alignment

[23] Strictly speaking, the common stock itself can also be regarded as a call option written on the firm value (see Black and Scholes (1973), Jensen and Meckling (1976), and Galai and Masulis (1976)). However, as will be discussed later, since most stocks with positive prices are deep-in-the-money options, the sensitivity of their values to firm risk is minimal (see Guay (1999) for empirical evidence).

H1 and H2 predict that managerial equity incentives measured by *delta* and *vega* have a positive effect on a firm's likelihood of issuing debt, with other determinants of firm financing choices being controlled for. The positive relationship, if confirmed by the data, begs the question of whether the effect of managerial equity incentives represents a dimension of the agency problem between shareholders and managers as we have argued so far, or managerial equity incentives are simply determinants of firms' *optimal* financing decisions that earlier studies overlook or fail to identify.

To answer this question, we examine the implications of the two competing explanations. The first set of implications is motivated by the leverage status of an issuing firm, i.e., whether it is under-levered or over-levered relative to its optimal leverage ratio. If managerial equity incentives indeed play a beneficial role and their impacts on firms' debt-equity choice represent an attempt by managers to move toward an optimal capital structure, then the relation between managerial equity incentives and securities issue decisions should depend on issuing firms' leverage status. Specifically, *delta* or *vega* should have a positive effect on the probability of debt offering in firms that are under-levered and a negative one in firms that are over-levered. In contrast, the conflict-of-interest hypothesis has no different predictions for under-levered firms and over-levered firms. Stated formally, the third part of our hypothesis is:

H-3: ***If the incentive-alignment hypothesis is valid, the managerial equity incentive will have a positive effect on the debt-issuing probability in under-levered firms and a negative one in over-levered firms, while the conflict-of-interest hypothesis predicts a positive effect regardless of the leverage status of the issuing firms.***

The second set of implications focuses on the market perception of managerial motives. We investigate how the market reaction to the announcements of securities issues is related to managerial equity incentives. Assuming that the market is efficient, we would observe a positive relationship between the announcement effect and managerial equity incentives if the incentive-alignment argument were true, and a negative one if the conflict-of-interest hypothesis were valid. Stated formally, the final piece of our hypothesis is:

H-4: ***Ceteris paribus, the announcement-period abnormal return associated with security offerings is negatively (positively) related to the managerial equity incentive if the conflict-of-interest (incentive-alignment) hypothesis is valid.***

3. Related literature

There are a number of theories in the literature that have some success in explaining firms' debt-equity choice. The 'pecking order' model in Myers and Majluf (1984) shows that the information asymmetry between potential new investors and managers who maximize the wealth of existing shareholders makes equity issues more costly than debt issues and therefore implies a financing hierarchy as described in Donaldson (1961), who observes that managers prefer to fund new investment with retained earnings rather than debt, but prefer debt to equity if outside financing is necessary. Another implication of the model is that firms issuing equity experience a negative stock market reaction since the market rationally updates its belief about the value of the firm based on the firm's issue decision.

The findings in Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995) that seasoned equity issuers on average experience severe long-run post-issue underperformance prompt another explanation, namely the timing model, for firms' issue decisions. Specifically, the timing model suggests that managers who serve the best interest of existing shareholders should sell overvalued shares in the market, but the model requires the market to under-react to the issuance announcements.

Jung, Kim, and Stulz (1996) propose an agency explanation for firms' debt-equity choices. They directly take issue with the underlying assumption of the 'pecking order' model that mangers serve the best interest of existing shareholders and argue that the private benefits of managers, i.e., the agency problem between shareholders and managers, also play a role in firms' financing decisions. In support of their hypothesis, they find that some firms choose to issue equity even when they do not have valuable investment opportunities but do have untapped debt capacity, a phenomenon that can only be explained by the agency model, and that such equity issues are greeted more negatively by the market. Nevertheless, they do not find much evidence in support of the aforementioned timing model. Our study can be regarded as a further test of the agency model in Jung et al (1996), since we show that managers do take their private benefits into consideration when making securities issue decisions. The irony is that it is the managerial stock and stock option holdings, which are meant to align the interests of shareholders and managers, that are culpable for the agency conflict.

Another related study is Berger, Ofek, and Yermack (1997), who find evidence consistent with the hypothesis that less entrenched CEOs take leverage-increasing actions. Among other things, they find that a firm's leverage change is positively related to the change in its CEO's percentage ownership of stock options that are exercisable within 60 days. Their sample consists of large firms in the *Forbes* 500s and the time period of their study (from 1984 to 1991) precedes the recent heavy usage of stock options in executive compensation. In addition, the fact that they only have information on each CEO's exercisable options makes it difficult to draw definitive inferences from their results. In contrast, we construct a more representative sample from members of the S&P 1500, we focus on the period from 1992 to 2001 when stock options quickly become the single most important component of executive pay, and our measure of CEO incentives from stock options is more accurate in that it encompasses both exercisable and unexercisable options. More importantly, Berger et al (1997) do not explore the perverse incentives that stock options could generate, while we present evidence to show that stock options induce CEOs to pursue sub-optimal financing decisions that increase their personal wealth at the expense of shareholders.

There have been many other studies that, theoretically or empirically, examine firms' debt-equity choice. Harris and Raviv (1991) provide an excellent review of the literature, which we will not try to reproduce here. We will, however, briefly discuss some of the papers when we describe in the next section the selection and construction of variables affecting firms' securities issue decisions.

In addition to the broad literature on debt-equity choice, our paper also connects with studies that examine the effect of EBC on firms' major decisions or overall performance. However, most researchers provide evidence extolling the incentive-alignment role of EBC, while others fail to address the effect of EBC on shareholder wealth at all. Rajgopal and Shevlin (2002) and Coles, Daniel, and Naveen (2004) both find evidence that executive stock options induce more risk-taking behavior by managers, but neither investigates the wealth consequences of these actions. Bliss and Rosen (2001) show that banks whose CEOs hold more stock options are less likely to engage in value-destroying acquisitions, suggesting that stock options help align the interests of shareholders and managers. Datta, Iskandar-Datta, and Raman (2001) document that the abnormal return both around and following the acquisition announcement is higher for acquiring firms whose top executives receive more equity-based compensations. Focusing on the corporate payout policy, the flip-side of the financing decision, Fenn and Liang (2001) find that managerial stock ownership is positively related to the level of payouts in firms with potentially the most severe agency problem.

Nevertheless, other findings in Fenn and Liang (2001) do provide a glimpse of the idea that we try to convey in this paper. Specifically, they show that consistent with the prediction in Lambert, Lanen, and Larcker (1989), firms whose executives hold more stock options are more likely to choose repurchases over dividends as a payout method, probably because (i) the value of executive stock options is decreasing in dividend yield based on the option pricing formula in Black and Scholes (1973), (ii) stock repurchases generally have a positive effect on the stock price, while dividend payouts a negative effect, and (iii) most executive stock options are not dividend protected. In other words, the executives' preference of repurchase over dividend seems to be driven by their concern over the value of their stock option portfolios.

4. Sample, variable construction, and empirical results

We carry out our investigation in two steps. First, we examine if and how CEO equity incentives measured by *delta* and *vega* are related to firms' choice between debt and equity as a financing method. Then we conduct further tests to shed more light on the question of whether the role played by CEO equity incentives in this context reflects better-aligned CEOs making optimal financing decisions for shareholders or CEOs looking after their own wealth at the expense of shareholders. The discussion of sample and variable construction and empirical results is accordingly divided into two parts.

4.1. First-stage: determinants of firms' securities issue decision

4.1.1. Sample and variable construction

Our initial sample consists of all seasoned common equity offerings and straight debt offerings from 1993 to 2002 collected by the Security Data Corporation (SDC). We then exclude offerings by issuers who (i) are in the utility or financial industries, (ii) do not have complete financial and stock price data available from COMPUSTAT and the Center for Research in Security Prices (CRSP), (iii) do not have executive compensation data from the Standard & Poor's *ExecuComp* database, or (iv) offered both equity and debt during a single year. We also delete purely secondary stock offerings from our sample, since they do not bring any new funds into the issuing firms and thus do not change the firms' financial position. Our final sample is composed of 605 seasoned equity offerings and 2133 straight debt offerings.[24] Panels A and B of

[24] It is not unusual that a firm conducts several debt offerings on a single day but in different amounts and under different terms. The SDC records each of the offerings as a separate transaction. In order to reduce the cross-sectional dependency of the observations and avoid artificially inflating the statistical significance of the coefficient estimates, we combine these offerings and treat them as one issue in our regression

Table I present the year and broad industry breakdowns, respectively, of the equity and debt issues. Note that in our sample debt offerings are much more common than equity offerings, a pattern that is also observed by other studies (see, e.g., Table I in Hovakimian, Opler, and Titman (2001)). There is no obvious concentration of debt or equity issues in any year, with years 1993, 1999 and 2000 having relatively more stock offerings and years 1996 through 1999 having relatively more bond issues. Based on two-digit SIC codes, over 50 industries are represented in our sample. About 50% of debt offerings and stock offerings are by firms in the manufacturing industries (SIC: 2000-3999), probably because there are more companies in these industries.

We build our model of firm securities issue choice by drawing upon a set of standard variables from the literature, in addition to *delta* and *vega*, our two CEO equity incentive measures. There is some anecdotal evidence that top executives other than CEOs, e.g., Chief Financial Officers (CFO), can also exert influence on firms' financing policy. Therefore, rather than focusing exclusively on CEO equity incentives, we also try to take full advantage of each firm's disclosure in *ExecuComp*, which details the five-highest-paid officers' compensation and their equity and stock option holdings. From this information, we construct the aggregate *delta* and *vega* for each firm's top management team.[25] Our logic is similar in spirit to that in Morck, Shleifer, and Vishny (1988), which focuses on the aggregate equity ownership of firm insiders including officers and board members and examines its effect on firm value and performance. We obtain qualitatively similar results using the aggregate equity incentive measures.

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analysis. Our results are qualitatively the same and statistically stronger if we treat each of the offerings as an independent observation.

[25] We also calculated the average or aggregate *delta* and *vega* for the top executives at each firm. We obtain qualitatively similar results using these alternative measures.

Table 2.1. Distributions of security offerings by year and industry

The sample consists of 605 seasoned common equity offerings and 2133 straight debt issues during a 10-year period from 1993 to 2002. Offerings by issuers who (i) are in the utility or financial industries, (ii) do not have complete financial and stock return data available from COMPUSTAT and the Center for Research in Security Prices (CRSP), (iii) do not have executive compensation information from the Standard & Poor's *ExecuComp* database, or (iv) offered both equity and debt during a single year, are excluded from the sample. Purely secondary stock offerings are also removed. Industries are classified based on 2-digit SIC codes.

Panel A. Year breakdown

Year	Number of equity offerings	Number of debt offerings
1993	76	200
1994	48	130
1995	55	219
1996	58	240
1997	58	252
1998	43	335
1999	85	208
2000	84	160
2001	52	225
2002	46	164
Total	605	2133

Panel B. Broad Industry breakdown based on 2-digit SIC codes

Industry description	2-digit SICs	Number of equity offerings	Number of debt offerings
Agriculture, forestry, and fisheries	01~09	1	7
Mineral industries	10~14	60	97
Construction industries	15~17	4	59
Manufacturing industries	20~39	307	1148
Transportation and communication	41~48	33	259
Wholesale trade	50~51	24	90
Retail trade	52~59	57	256
Service industries	70~89	117	208
Public administration	90~99	2	9
Total		605	2133

We treat stocks and stock options separately in calculating *delta* and *vega* for each CEO during each year in our sample. The component of *delta* due to the common stock and restricted stock in a CEO's wealth portfolio is easy to compute, because the value of stock changes by 1% when the stock price changes by 1%.[26] For *delta* and *vega* attributed to stock options, we follow the procedures described in Core and Guay (2002).[27] Core and Guay's method requires only one year of proxy information, but yields estimates of *delta* and *vega* that are effectively unbiased and 99% correlated with the estimates that would be obtained if more years of proxy statements were collected and the true parameters of an executive's entire option portfolio were known. Strictly speaking, stocks contribute to *vega* as well, since they can be considered as call options written on the firm value. However, Guay (1999) shows that compared to stock options, the value of stock changes very little with the volatility of the underlying firm value since most of the stocks, with positive prices, are deep-in-the-money options and the value of deep-in-the-money options is insensitive to volatility. Therefore, we focus only on stock options in computing *vega*. In summary, the *delta* of each CEO's wealth portfolio is the sum of the *delta* from common and restricted stock and the *delta* from stock options, while the *vega* of each CEO comes solely from stock options (see the Appendix for a detailed description of the procedure).

In addition to the two managerial equity incentive measures, the determinants of firms' debt-equity choice in our model also include macroeconomic conditions and firm characteristics such as size, financial slack, tax status, Tobin's Q, profitability, leverage, tangibility, refinancing needs, stock return volatility, and recent stock price run-up. These variables are widely used in empirical studies of capital structure. Masulis (1988) and Harris and Raviv (1991) contain references to the studies on capital structure that utilize these variables to capture the potential

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[26] Strictly speaking, the value of restricted stocks changes by less than 1% when the stock price changes by 1%, since they are not readily tradable as the CEO's common equity holdings. But unfortunately, the literature has not come up with a method to address this concern, and we believe the resulting deviation to be minor and inconsequential.

[27] The same method has been utilized in many recent studies related to executive compensation (see, e.g., Core and Guay (1999), Jin (2002), Rajgopal and Shevlin (2002), and Coles et al. (2004)).

savings from debt services, the cost of financial distress or bankruptcy, or the degree of information asymmetry faced by the issuing firms.

Because of the deductibility of interest payments, a number of papers argue that the gains from debt financing relative to equity financing increase with a firm's marginal tax rate. Following Jung et al (1996), we measure a firm's potential gains from having more debt in its capital structure by the ratio of tax payments divided by the book value of total assets for the year preceding the issue. The higher the firm's tax rate for the previous year, the more likely the corporate-tax shield from added debt service will be fully utilized and the more valuable the tax shield will be. Therefore, firms with higher tax rates are more likely to issue debt than equity.

Despite the tax savings, additional debt will increase the probability of bankruptcy and the expected cost of financial distress. If prior to the security issue a firm already has a high probability of financial distress, the expected cost of debt issuance may outweigh the expected benefit and in this case debt financing would be less desirable to the firm than equity financing. We employ three proxies for a firm's probability of financial distress. The first one is the leverage ratio, which is equal to the book value of long-term debt and short-term debt divided by the book value of total assets at the end of the year prior to the issue; the second one is the monthly stock return volatility measured over the past 60 months prior to the security issue; and the last one is profitability, which is measured by the return on assets (ROA), i.e., earnings before interest, tax, depreciation and amortization (EBITDA) divided by the book value of total assets, for the year prior to the issue.

The degree of information asymmetry between prospective shareholders and issuing firm's managers, who are assumed to act in the best interests of existing shareholders, may also affect firm's choices between debt and equity financing by making equity issuance more expensive (Myers and Majluf (1984)). Korajczyk, Lucas, and McDonald (1991), therefore, argue that firms should time their equity issues for periods when the information asymmetry is less severe. Along the lines of Lucas and McDonald (1990), we proxy for the information asymmetry faced by an issuer by its net-of-market stock return over the year prior to the issue and its market-to-book ratio (as a proxy for Tobin's Q) at the end of the previous year. The firm's market value is approximated by the book value of total assets minus the book value of common equity plus the market value of common equity. A higher level of either of the two measures is an indication of less information asymmetry. Following Choe, Masulis, and Nanda (1993) and Jung et al (1996), we also include in our regression the 6-month leading indicator as a gauge of macroeconomic conditions, since some authors suggest that there is less information asymmetry when the economy is in expansion than when it is in recession.[28] The model in Myers and Majluf also implies that firms with more financial slack are more likely to issue equity since the presence of financial slack, one form of assets in place, can reduce the degree of information asymmetry. We measure financial slack by cash and liquid assets normalized by total assets. Another variable that more directly measures assets in place is the tangibility ratio, calculated as the net book value of plant, property and equipment (PPE) over the book value of total assets. We expect it to be negatively associated with the degree of information asymmetry and thus to raise the probability of issuing equity. However, a higher proportion of tangible assets also implies that a firm has more debt capacity because of the collaterability of tangible assets and is more able or likely to issue debt as a result. Therefore, the net impact of tangibility on firms' debt-equity choice is ambiguous.

Our list of regressors also includes a proxy for firm size, which is equal to the logarithmic transformation of an issuing firm's book value of total assets in million dollars. Firm size affects both the cost of financial distress and the information asymmetry. Larger firms tend to have diversified revenue streams and thus are less likely to succumb to negative shocks specific to certain sectors. The impact of firm size on the information asymmetry, however, is more complicated. On the one hand, larger firms are subject to more public scrutiny and have more

[28] Our results do not change if we simply use year dummy variables to capture the peaks and troughs of the business cycle.

analyst coverage, and therefore face less information asymmetry. On the other hand, larger firms may have more complex operations that outsiders find difficult to decipher, resulting in a higher degree of information asymmetry. Only the empirical analysis can tell which effect is dominant.

Since firms often sell bonds to replace the debt that is coming due soon, usually within a year, we use the proportion of short-term debt in total debt to measure a firm's refinancing needs and predict that firms with higher short-term debt ratio are more likely to issue new debt.

Finally, we control for the relative size of the security offering measured by issue proceeds normalized by the market value of equity, since issue size has been found to affect the choice between debt and equity in some studies. However, there is some concern that the issue size may also be endogenously determined, just as the type of security in the offering. Therefore, the relative issue size can not be used by investors to forecast a firm's debt-equity choice since ex ante investors generally have little knowledge about how much the firm is going to raise. On the other hand, regressions with the relative issue size as an independent variable are desirable if the amount of financing can affect a manager's decision regarding which security to offer.[29] Therefore, we run separate regressions with and without the issue size as a regressor and the results suggest that the coefficient estimates of other regressors are not sensitive to our choice. Note that all explanatory variables except issue size are measured before the security offerings as an attempt to eliminate the simultaneity bias.

4.1.2. Descriptive statistics and univariate analysis

Table II presents the descriptive statistics for the explanatory variables discussed above. It is easy to see that debt-issuing firms and equity-issuing firms differ considerably in many dimensions. For instance, firms issuing equity are significantly smaller in size, enjoy lower tax rates and higher market-to-book ratios and recent stock returns, and have more financial slack,

[29] Possible reasons include that firms have only a limited amount of untapped debt capacity and that firms worry about the dilution effect of large equity offerings.

Table 2.2. Summary statistics

Total assets, denominated in million dollars, is equal to the book value of total assets. *Market equity*, denominated in million dollars, is equal to the number of common shares outstanding multiplied by the stock price. *Volatility* is computed as the monthly stock return volatility over the past 60 months. *Tobin's Q* is equal to a firm's market value divided by its book value, where the market value of a firm is calculated as the book value of total assets minus the book value of common equity plus the market value of common equity. *ROA* is calculated as earnings before interest, tax, depreciation and amortization (EBITDA) divided by total assets. *Slack* is measured as the value of cash and liquid assets normalized by total assets. *Tangibility* is equal to the book value of plant, property, and equipment divided by the book value of total assets. *Refinancing* is equal to the percentage of short-term debt in total debt, i.e., the sum of short-term debt and long-term debt. *Leverage* is equal to the book value of total debt divided by the book value of total assets. *Tax status* is equal to the tax payments divided by total assets. *Proceeds*, denominated in million dollars, is the amount raised from each security offering. *Relative size* is equal to the ratio of *Proceeds* to *Market equity*. *Runup* is the net-of-market stock return over the year prior to the security offering. *6-month leading indicator* is the six-month growth rate of the leading indicator. *Delta*, denominated in thousand dollars, is the value-stock price sensitivity of a CEO's stock and option portfolio and is calculated as the dollar change in the value of the CEO's stock and option portfolio per 1% change in the underlying stock price. *Vega*, denominated in thousand dollars, is the value-stock return volatility sensitivity of a CEO's stock and option portfolio and is calculated as the dollar change in the value of the CEO's stock and option portfolio per 0.01 change in the stock return volatility. All dollar figures are year-2002 dollars.

	All issues		Equity issues		Debt issues			
Variable	Mean	Median	Mean	Median	Mean	Median	t-stat	z-stat
Total Assets	13,119	4,897	1,452	307	16,429	7,387	-22.73	-32.87
Market equity	20,040	4,745	2,004	533	25,156	8,801	-24.91	-30.47
Volatility	0.33	0.29	0.52	0.49	0.28	0.26	29.59	30.32
Tobin's Q	2.25	1.75	3.10	2.10	2.00	1.68	9.35	9.25
ROA	0.15	0.16	0.11	0.13	0.17	0.16	-9.17	-10.24
Slack	0.07	0.02	0.18	0.08	0.04	0.02	15.82	16.19
Tangibility	0.38	0.35	0.31	0.22	0.40	0.37	-8.45	-11.02
Refinancing	0.02	0.01	0.02	0.00	0.02	0.01	-4.63	-7.99
Leverage	0.29	0.29	0.23	0.21	0.31	0.31	-8.99	-11.58
Tax status	0.03	0.02	0.02	0.01	0.03	0.03	-6.86	-10.56
Proceeds	431	161	195	109	498	184	-8.81	-7.12
Relative size	0.12	0.04	0.24	0.18	0.09	0.02	11.88	26.44
Runup	0.23	0.05	0.99	0.51	0.01	-0.01	14.42	22.56
6-month leading indicator	0.01	0.01	0.01	0.01	0.01	0.01	1.64	2.06
Delta	1,400	399	830	215	1,561	442	-5.04	-11.17
Vega	224	72	49	18	273	104	-17.28	-22.72

lower leverage and less refinancing needs, while they are less profitable and more risky, and have lower tangibility ratios. There is also evidence that firms are more likely to sell equity rather than debt when macroeconomic conditions are more favorable.

More important to our hypothesis, we find that CEOs at equity-issuing firms have markedly lower *delta* and *vega* than their counterparts at bond-issuing firms. The univariate analysis, however, is only suggestive and does not provide us with reliable inferences. For example, Baker and Hall (1998) show that CEOs at larger firms often have higher levels of equity incentives, and our data indicates that larger firms are more likely to issue debt. Therefore, the positive correlation between the probability of firm issuing debt and managerial equity incentives might simply proxy for the positive correlation between firm size and the probability of firm issuing debt. Therefore, we next turn our attention to multivariate probit regression analyses.

4.1.3. The probit analysis

Our probit model of firms' debt-equity choice includes all the explanatory variables previously discussed in section A1 and is specified as follows:

$$\begin{aligned}\text{Probability}(y=1) = \Phi\,(&\alpha_0 + \alpha_1 \log(1+\textit{delta}) + \alpha_2 \log(1+\textit{vega}) + \alpha_3\, \textit{tax status} + \alpha_4\, \textit{Tobin's Q} \\ &+ \alpha_5\, \textit{ROA} + \alpha_6\, \textit{volatility} + \alpha_7\, \textit{volatility-squared} + \alpha_8\, \textit{6-month leading indicator} \\ &+ \alpha_9\, \textit{run-up} + \alpha_{10} \log(\textit{total assets}) + \alpha_{11} \log(1+ \textit{relative size}) + \alpha_{12}\, \textit{leverage} \\ &+ \alpha_{13}\, \textit{slack} + \alpha_{14}\, \textit{refinancing} + \alpha_{15}\, \textit{tangibility} \\ &+ \lambda' \cdot \text{vector of industry dummy variables} + \varepsilon),\end{aligned}$$

where y is a binary variable that takes the value of zero for debt offerings and one for equity offerings, and Φ is the cumulative standard normal distribution function. To be consistent with the literature, we use the logarithmic transformations of *total assets*, *relative size*, *delta* and *vega* to remove the skewness in the original data. Volatility squared is included to capture any non-monotonic effect of firm risk.[30]

We estimate a number of variations of the full model and report the regression results in Table III. Consistent with the findings in earlier studies such as Jung et al (1996) and the inferences from univariate analyses, we find that firms with higher Q or greater recent stock price run-up are more likely to choose equity financing, while larger and more profitable firms are more likely to resort to debt financing, and that stock offerings are more likely to occur during economic booms. We also find that firms with lower leverage, more refinancing needs, and higher tangibility ratios are more likely to issue debt, though the statistical significance levels of these relations are rather low. The evidence on the effect of stock return volatility is fairly interesting. It appears that the probability of an equity offering increases with stock return volatility at a decreasing rate. This non-monotonicity is consistent with volatility measuring both information asymmetry and the probability of financial distress. When the stock return volatility is very high, managers may find it too expensive to issue equity due to severe information asymmetry, even though equity financing is desirable from the standpoint of reducing the probability of financial distress.

More interestingly, we find evidence consistent with our second hypothesis H-2 that firms are less likely to issue equity and more likely to issue debt where their CEOs have higher *vega*. CEOs' *delta* does not appear to affect firms' debt-equity choice.[31] This suggests that it is the stock option holdings that tilt the CEOs' preference between debt and equity. All four specifications in Table III have pseudo-R^2 over 70%, and are able to correctly classify about 95%

[30] In addition to being a proxy for firm risk, stock return volatility is also a measure of information asymmetry surrounding a firm. When the stock return volatility is very high, managers may find it too expensive to issue equity because of the information asymmetry even though equity financing is desirable from the standpoint of reducing the probability of financial distress. Another possibility is that CEOs at firms with very high risk may prefer debt to equity in order to exploit the creditors through asset substitution.

[31] One possible offsetting effect is that CEOs with higher *delta* are more risk averse since their wealth are more sensitive to stock price, and as a result, they could end up eschewing debt financing.

Table 2.3. Probit analysis of security issue decisions

The sample consists of 605 equity issues and 2133 bond issues from 1993 to 2002. The dependent variable takes the value of one for equity issues and zero for bond issues. All explanatory variables are as defined in Table II. Presented in the table are the maximum-likelihood coefficient estimates with two-sided *p*-values in the parentheses. The pseudo-R^2 is equal to 1-(loglikelihood at convergence/loglikelihood at zero). The coefficient estimates for the industry dummy variables are suppressed.

Independent variable	Model (1)	Model (2)	Model (3)	Model (4)
Log (1+ *delta*)	0.043 (0.328)			
Log (1+*vega*)	-0.138 (0.000)	-0.132 (0.001)	-0.127 (0.001)	-0.106 (0.006)
Tax status	-4.640 (0.168)	-4.848 (0.152)	-4.495 (0.156)	-4.525 (0.148)
Tobin's Q	0.175 (0.041)	0.197 (0.015)	0.219 (0.004)	0.241 (0.001)
ROA	-7.558 (0.000)	-7.480 (0.000)	-7.954 (0.000)	-6.793 (0.000)
Volatility	5.107 (0.000)	5.196 (0.000)	5.251 (0.000)	4.507 (0.000)
Volatility-squared	-1.887 (0.000)	-1.901 (0.000)	-1.915 (0.000)	-1.683 (0.000)
Leading indicator	14.485 (0.003)	14.784 (0.003)	14.598 (0.003)	13.307 (0.007)
Runup	1.030 (0.000)	1.038 (0.000)	1.053 (0.000)	0.993 (0.000)
Log (*total assets*)	-0.771 (0.000)	-0.759 (0.000)	-0.770 (0.000)	-0.668 (0.000)
Log (1+ *relative size*)	-2.122 (0.000)	-2.149 (0.000)	-2.118 (0.000)	
Leverage	0.323 (0.468)	0.307 (0.495)		
Refinancing	-2.229 (0.329)	-2.302 (0.312)		
Slack	0.403 (0.611)	0.362 (0.647)		
Tangibility	-0.462 (0.205)	-0.473 (0.196)		
Intercept	1.819 (0.010)	1.916 (0.007)	1.700 (0.011)	1.104 (0.069)
Industry dummies	Included	Included	Included	Included
Pseudo-R^2	73.66%	73.63%	73.52%	72.62%

of the securities issue decisions, a number that compares favorably to those in other studies. For example, Marsh (1982) reports a 75% correct classification rate, and the regressions in Jung et al (1996) correctly classify from 74% to 81% of the decisions.

Having established the statistical significance of the effect of *vega*, we next evaluate its economic significance. To do so, we follow the commonly used approach in the literature and focus on an imaginary firm for which all the independent variables are set to equal their respective sample means. We compute the marginal effects based on the coefficient estimates of model (3) in Table III.[32] The predicted probability of issuing equity for the imaginary firm is 4.41%. A one standard deviation increase in the value of log (1+*vega)* will decrease the probability by 2.00%, representing a 45% (≈2.00/4.41) drop. Therefore, *vega* appears to have an economically significant impact on firms' debt-equity choice as well. However, since the marginal effects so calculated depend on the choice of initial levels of the independent variables, we recommend interpreting this result with caution.

4.2. Second-stage: conflict of interest or incentive alignment?

Now that we have shown that firms whose CEOs have a higher *vega* are more likely to issue debt than to issue equity, we turn our attention to the more interesting question, i.e., whether *vega* is simply a determinant of firms' *optimal* securities issue decision that has been overlooked by previous studies, or its impact on firms' financing policy is a manifestation of the conflict of interest between shareholders and managers. The intuition seems to favor the former possibility, since managerial equity incentives are put into place by the board of directors to align the interests of shareholders and mangers after all. But this interpretation is tenuous when confronted with two questions. First, regression results in Table III indicate that only *vega* has a significantly negative coefficient while *delta* has little impact on the firm's issuing decision, a discrepancy that

[32] The marginal effect per standard deviation of variables *j* that has a coefficient α_j is $\phi(\boldsymbol{x}'\cdot\boldsymbol{\alpha})\cdot\alpha_j\cdot\sigma_j$, where $\phi(\cdot)$ is the standard normal density function, $\boldsymbol{x}$ is a vector of values of the independent variables, $\boldsymbol{\alpha}$ is the vector of coefficient estimates, and σ_j is the standard deviation of variable *j*.

is difficult for the incentive-alignment argument to reconcile. Second, the interest alignment explanation is silent about how a higher level of managerial equity incentive benefits the shareholders in the firm's security issue decision, or alternatively, where the benefits come from, as our probit regressions have already controlled for at least the direct effects of potential tax savings of additional debt services, the expected cost of financial distress, and the degree of information asymmetry. In contrast, the first two predictions of our conflict-of-interest hypothesis, H1 and H2, are clear about the channels through which debt and equity financings can have quite different impact on CEOs' equity-related wealth.

We conduct two sets of tests in order to better differentiate the two competing conjectures. First, based on double-censored Tobit regressions of leverage, we divide our sample firms into two categories, i.e., those over-levered and those under-levered relative to an optimal debt/asset ratio determined by such firm characteristics as size, investment opportunities, tangibility, uniqueness, profitability and tax status. If *vega* indeed plays an incentive-aligning role, we expect it to have different impact on financing policies between under-levered and over-levered firms. Specifically, in firms with below-optimal leverage, *vega* should be positively related to the probability of debt offering, while in firms with above-optimal leverage, the relationship should be negative, assuming that managers maximize shareholder value by moving toward the optimal capital structure. In contrast, the conflict-of-interest hypothesis does not have different predictions that hinge on whether a firm is under- or over- levered.

In the second set of tests we examine how the market reaction to the announcement of securities issues is related to managerial equity incentives, *vega* in particular. If the market is sufficiently efficient, the incentive-alignment hypothesis predicts a positive association, while the conflict-of-interest argument implies a negative one.[33]

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[33] The semi-strong form market efficiency would suffice, since the information on all the explanatory variables in our model is publicly available prior to the security issues.

4.2.1. Under-levered vs. over-levered

The parsimonious model we use to estimate the optimal leverage ratio is similar to those in earlier studies of capital structure, and is specified as follows:[34]

$$Leverage = \alpha_0 + \alpha_1 \log(total\ assets) + \alpha_2\, ROA + \alpha_3\, Tobin's\ Q + \alpha_4\, tangibility + \alpha_5\, R\&D\ ratio$$
$$+ \alpha_6\, SGA\ ratio + \lambda' \cdot \text{vector of year and industry dummy variables} + \varepsilon,$$

where *R&D ratio* is equal to R&D expenses divided by net sales, *SGA ratio* is equal to selling, general, and administrative expenses divided by net sales, and all other variables are as defined earlier in section A1. Since leverage is bounded between 0 and 1, we estimate the above model using double-censored Tobit regressions.

We use the entire *ExecuComp* universe from 1992 to 2001 to estimate the leverage regressions. The coefficient estimates are reported in Table IV. Consistent with extant evidence, we find that leverage is higher at larger firms or firms with more tangible assets and lower in more profitable firms, firms with more investment opportunities, or firms with higher product or technology uniqueness measured by the *R&D ratio* and the *SGA ratio*. These results are robust to whether the dependent variable is book leverage or market leverage.

Based on the coefficient estimates in Table IV, we deduce an optimal leverage ratio for each firm-year observation in our security-offering sample. Whether an issuing firm is under-levered or over-levered is determined at the end of the fiscal year prior to security offering, thus avoiding the reverse-causality concern. The subsample of under- (over-) levered firms consists of firms whose leverage at the end of a given year are below (above) their respective optimal level. We repeat the probit analysis of debt-equity choice in section A3 on the whole sample and each

[34] See, e.g., Titman and Wessels (1988), Rajan and Zingales (1995), Berger, Ofek, and Yermack (1997), and Hovakimian, Opler, and Titman (2001) for an incomplete list of references.

Table 2.4. Coefficient estimates of the model of optimal leverage ratio

The sample consists of 15737 firm-year observations from 1992 to 2001. *ExecuComp* firms with valid COMPUSTAT data are included. The dependent variable is either the book leverage, calculated as the book value of total debt divided by the book value of total assets, or the market leverage, calculated as the book value of total debt divided by the market value of total assets, where the market value of total assets is equal to the book value of total assets minus the book value of common equity plus the market value of common equity. *R&D ratio* is the R&D expenditure divided by net sales. *SGA ratio* is the selling, general, and administrative expenses divided by net sales. All other variables are as defined in Table II. Presented in the table are doubled-censored Tobit coefficient estimates with two-sided *p*-values in the parentheses. The coefficient estimates for the industry and year dummy variables are suppressed.

Independent variables	Coefficient estimates (p-values)	
	Book leverage	Market leverage
Log (*total assets*)	0.029 (0.000)	0.021 (0.000)
ROA	-0.251 (0.000)	-0.273 (0.000)
Tobin's Q	-0.010 (0.000)	-0.015 (0.000)
Tangibility	0.192 (0.000)	0.149 (0.000)
R&D ratio	-0.007 (0.000)	-0.009 (0.000)
SGA ratio	-0.024 (0.037)	-0.020 (0.117)
Intercept	0.053 (0.021)	0.072 (0.004)
Industry dummies	Included	Included
Year dummies	Included	Included
Chi-squared (p-value)	5699 (0.000)	6612 (0.000)
Adjusted-R^2 (from OLS)	22.01%	32.06%

Table 2.5. Subsample probit analysis of security issue decisions

The sample consists of 605 equity issues and 2133 bond issues from 1993 to 2002. The under-levered (over-levered) firm-year observations are those with book leverage below (above) their optimal level based on the estimates in Table IV. The dependent variable takes the value of one for equity issues and zero for bond issues. All explanatory variables are as defined in Table II. Presented in the table are the maximum-likelihood coefficient estimates with two-sided *p*-values in the parentheses. The pseudo-R^2 is equal to 1-(loglikelihood at convergence/loglikelihood at zero). The coefficient estimates for the industry dummy variables are suppressed.

Independent variable	Coefficient estimates (p-values)		
	Full sample	Over-levered	Under-levered
Leverage surplus	0.935 (0.102)	2.071 (0.072)	0.972 (0.613)
Log (1+*vega*)	-0.131 (0.001)	-0.190 (0.002)	-0.133 (0.025)
Tax status	-4.618 (0.162)	-12.323 (0.024)	3.726 (0.455)
Tobin's Q	0.208 (0.011)	0.150 (0.275)	0.229 (0.073)
ROA	-7.480 (0.000)	-5.613 (0.007)	-9.128 (0.000)
Volatility	5.137 (0.000)	10.017 (0.000)	5.900 (0.000)
Volatility-squared	-1.874 (0.000)	-7.299 (0.001)	-2.013 (0.000)
Leading indicator	14.586 (0.003)	23.530 (0.002)	10.142 (0.161)
Runup	1.052 (0.000)	1.198 (0.000)	0.914 (0.000)
Log (*total assets*)	-0.748 (0.000)	-0.773 (0.000)	-0.684 (0.000)
Log (1+ *relative size*)	-2.307 (0.000)	-3.167 (0.000)	-1.829 (0.027)
Refinancing	-2.852 (0.199)	-1.581 (0.596)	-9.960 (0.040)
Slack	0.353 (0.654)	0.456 (0.707)	2.122 (0.119)
Tangibility	-0.384 (0.286)	-0.486 (0.429)	0.331 (0.521)
Intercept	2.005 (0.004)	9.061 (0.000)	0.347 (0.718)
Industry dummies	Included	Included	Included
Pseudo-R^2	73.70%	73.37%	77.23%

of the two subsamples, and present the results in Table V.[35] In these regressions, we also include a firm's deviation from its optimal leverage, i.e., its actual leverage minus its predicted optimal leverage, as an additional explanatory variable denoted as *leverage surplus*, which can take both positive and negative values. We expect this variable to have a positive (negative) effect on the probability of equity (debt) financing if firms attempt to move toward their optimal capital structure. The prediction is confirmed by the data in that *leverage surplus* has a uniformly positive coefficient estimate that is statistically significant for the whole sample and the over-levered subsample. More importantly, the logarithmic transformation of *vega* continues to have a significantly negative coefficient in all three regressions, suggesting that CEOs with higher *vega* avoid equity financing and prefer debt financing even when their firms are already over-levered. This evidence strongly supports the conflict-of-interest conjecture while casting doubt on the incentive-alignment hypothesis.

Nevertheless, the incentive-alignment hypothesis could still be true if the model we use to estimate optimal leverage were mis-specified and somehow, most or all of the issuing firms in our sample were in fact under-levered. Though we deem this unlikely, we carry out a second set of tests in order to shed more light on this issue. Specifically, we examine how the market perceives the role played by *vega* by examining the abnormal returns around security issue announcements.

4.2.2. Analysis of the announcement effects of security issues

Following other studies in the literature (see, e.g., Masulis and Korwar (1986) and Jung et al (1996)), we exclude rights offerings and shelf offerings from our sample of equity issues. For the remaining security offerings, we use *Factiva* to search for the announcement dates, which are defined as the date of the first mention of a security issue before the issuing date. We remove from our sample security issues for which we could not find such announcements. Among the

[35] Since the results are not sensitive to the leverage measure, we only report those based on market leverage to be consistent with Berger et al (1997) and Hovakimian et al (2001).

issues with announcement dates, we delete those with confounding events within a 3-day window around the announcement dates, i.e., from the day immediately before the announcement date to the day immediately after. The confounding events include the announcements of earnings, dividend, M&As, or simultaneous offerings of other securities. Compared to stock offering announcements, debt offering announcements are more often contaminated by the aforementioned confounding events, the most common of which is the filing of mixed security offerings. Many debt offerings even do not have public announcements before the issuing date. The final sample of security offerings with un-contaminated announcement dates consists of 359 stock offerings and 345 debt offerings.

We measure the cumulative abnormal return (CAR) over a two-day event window that includes the announcement date and the following trading day, since sometimes the announcement comes after the close of trading. We compute the abnormal returns based on the residuals from a market model. The median (mean) CAR over the event window is -2.88% (-2.74%) with *p*-value less than 0.001 for equity offerings, and -0.15% (-0.10%) with *p*-value around 0.37 for straight debt offerings. The magnitude of the market reaction is similar to what other studies find.[36]

Since the explanatory variables may have different impacts on CAR for debt issues and equity issues, we treat the two types of offerings separately in the following analyses. The dependent variable in our OLS regressions of announcement effect is the CAR inflated by 100. For example, a CAR of 3.00% would be simply 3.00 in the regressions. The explanatory variables include all the determinants of security issue decision whose coefficients are significant in our earlier probit analysis. For stock issuances, we also construct a measure of the percentage of secondary shares in each offering, since selling by firm insiders in the offering is often perceived

[36] See, e.g., Asquith and Mullins (1986), Eckbo (1986), Jung, Kim, and Stulz (1996), Masulis and Korwar (1986), and Mikkelson and Partch (1986).

by the market as bad news and drives down the stock price. We report the estimation results in Table VI.

We find that *vega* has a significantly negative impact on the announcement effect in both regressions, evidence that is in favor of the conflict-of-interest hypothesis and difficult to justify for the incentive-alignment argument. Note that the negative effect of *vega* on CAR is not only statistically significant, but also economically so. The standard deviation of log (1+*vega*) is about 1.5 in both the equity-offering subsample and the debt-offering subsample. Therefore, based on the coefficient estimates in Table VI, one standard deviation increase in *vega* on average reduce announcement-period abnormal returns by 0.66% for the equity issuers and 0.46% for the debt issuers.[37] Among other things, we also find that as an important measure of information asymmetry, Tobin's Q is positively related to the CAR for both types of security issues, but the relationship is only marginally significant with p-values of 0.097 and 0.103, respectively, in the two regressions. For stock offerings alone, we find that the CAR is also positively related to ROA and past 6-month leading indicator, both of which can be considered as inverse measures of information asymmetry as well, and that the higher the percentage of secondary shares in the offering, the more negative the CAR is. These results are in line with the findings in Choe, Masulis, and Nanda (1993), Jung, Kim, and Stulz (1996), and Masulis and Korwar (1986). For debt offerings, besides Tobin's Q, only the recent stock price run-up has a positive effect on CAR.

4.3. Regressions of leverage changes on vega

Since our sample consists of only public debt and equity financings, we might have overlooked other important leverage-altering decisions by firms, such as borrowing from bank and other private lenders, selling convertible bonds or preferred stock, and redeeming debt. In this section, we take a more aggregate perspective in examining how changes in firm leverage from

[37] $0.66=0.437\times1.5$, and $0.46=0.304\times1.5$.

Table 2.6. OLS Regressions of announcement effects of security offerings

Coefficient estimates from OLS regressions are presented in the table with the heteroskedasticity-consistent (White, 1980) *p*-values in parentheses. We exclude equity issues that are rights offerings or shelf offerings. Using *Factiva*, we are able to identify un-contaminated announcement dates before the issuing for 379 stock offerings and 334 debt offerings. *Secondarypct* is equal to the percentage of secondary shares in each stock offering. All other explanatory variables are as defined in Table II.

Independent variable	CARs of equity issues	CARs of debt issues
Log (1+*vega*)	-0.437 (0.003)	-0.304 (0.001)
Tax-status	-10.232 (0.488)	-11.056 (0.254)
Tobin's Q	0.246 (0.097)	0.262 (0.103)
ROA	4.765 (0.077)	-0.704 (0.815)
Volatility	-0.824 (0.317)	0.691 (0.733)
Leading indicator	48.243 (0.064)	19.812 (0.207)
Runup	-0.075 (0.768)	0.946 (0.089)
Log (*total assets*)	-0.235 (0.483)	-0.089 (0.453)
Log (1+ *relative size*)	0.352 (0.468)	0.083 (0.475)
Secondarypct	-3.260 (0.006)	
Intercept	4.172 (0.280)	4.825 (0.020)
Adjusted-R^2	2.68%	3.95%
Number of observations	359	345

one year to the next are related to *vega*. For this analysis, we construct a sample of 11299 firm-year observations from 1992 to 2001 by merging COMPUSTAT with ExecuComp. The dependent variable we look at is the difference in a firm's leverage between two consecutive years, i.e., $leverage_{t+1} - leverage_t$. The explanatory variables include vega, leverage surplus, firm size, ROA, Tobin's Q, volatility, tangibility, the presence of net operating loss carryforward (NOLC) and investment tax credit (ITC), and product or technology uniqueness proxied by R&D ratio and SGA ratio as defined earlier. All explanatory variables are measured at the end of year t. OLS regression results are presented in Table VII. The results for the full sample and the two subsamples indicate that CEOs with higher *vega* tend to increase firm leverage even if their firms are already over-levered, echoing what we find earlier.

4.4. Sensitivity tests

Our results are robust to the following variations of our empirical analysis: (i) in the debt-equity discrete choice model, we control for CEO tenure, whether a CEO is the founder, CEO total cash compensation, and firm leverage change in the year prior to security offering; (ii) we use the presence of net operating loss carryforward or Graham's (1996) marginal tax rate to proxy for a firm's tax status; (iii) similar to Korajczyk and Levy (2003), we augment the optimal-leverage model with two macroeconomic variables: CRSP value-weighted return over the past two years and the growth rate of the leading indicator over the past year; (iv) we measure firm risk by the daily stock return volatility over the past year prior to the issue; (v) we measure a firm's risk of financial distress by Altman's Z-score; (vi) we replace book leverage and book value of total assets with market leverage and market value of equity, respectively; (vii) we measure profitability by the ratio of operating cash flow to total assets; (viii) we estimate the debt-equity discrete choice model in a logit regression framework; (ix) we adjust all explanatory variables for their respective industry (based 2-digit SIC codes) medians; and (x) we winsorize all explanatory variables at their respective 1st and 99th percentiles. We also create an interaction

Table 2.7. Regressions of leverage changes on vega

The sample consists of 11299 firm-year observations from 1992 to 2001. *ExecuComp* firms with valid COMPUSTAT data are included. The under-levered (over-levered) firm-year observations are those with book leverage below (above) their optimal level based on the estimates in Table IV. The dependent variable is the change in leverage from one year to the next. *NOLC* is the ratio of net operating loss carryforward to the book value of total assets. *ITC* is the ratio of investment tax credit to the book value of total assets. All other explanatory variables are as defined in Table II. Presented in the table are the OLS coefficient estimates with two-sided *p*-values in the parentheses. The coefficient estimates for the industry and year dummy variables are suppressed.

Independent variable	Coefficient estimates (p-values)		
	Full sample	Over-levered	Under-levered
Leverage surplus	-0.184 (0.000)	-0.266 (0.000)	-0.159 (0.000)
Log (1+*vega*)	0.002 (0.000)	0.003 (0.003)	0.001 (0.036)
Log (*total assets*)	-0.002 (0.027)	-0.002 (0.076)	-0.001 (0.458)
ROA	0.026 (0.003)	-0.011 (0.571)	0.035 (0.001)
Tobin's Q	0.002 (0.000)	0.003 (0.000)	0.000 (0.927)
Volatility	0.022 (0.021)	-0.008 (0.643)	0.042 (0.000)
Volatility-squared	-0.004 (0.342)	0.006 (0.381)	-0.010 (0.010)
Tangibility	-0.010 (0.142)	-0.008 (0.565)	-0.006 (0.448)
NOLC	-0.005 (0.029)	-0.015 (0.059)	-0.001 (0.614)
ITC	-1.622 (0.089)	-0.861 (0.765)	-2.072 (0.051)
R&D ratio	-0.003 (0.714)	0.017 (0.486)	-0.011 (0.074)
SGA ratio	0.002 (0.611)	-0.009 (0.542)	0.006 (0.140)
Industry dummies	Included	Included	Included
Year dummies	Included	Included	Included
Adjusted-R^2	10.59%	10.94%	5.97%

term between *vega* and volatility, but the interaction term does not have a significant coefficient in the probit model regressions.

We also experiment with replacing the logarithmic transformation of *vega* with an interaction term between CEO option ownership and the options' convexity. We find (unreported) that the interaction term has a significantly positive effect on the probability of debt offering, which is consistent with the reported positive effect of *vega* on debt financing.

5. Conclusion

As the conventional wisdom goes, managerial equity incentives help mitigate the agency problem prevalent in large public corporations. However, our study presents evidence showing that in firms' financing decisions, managerial equity incentives, especially with respect to stock option holdings, is a source of conflicts of interest between shareholders and managers. The results from our probit analysis suggest that since bond offerings have a positive effect on firm leverage and stock return volatility, CEOs who have a higher *vega* or whose wealth is more sensitive to stock return volatility find debt financings more attractive than equity financings. We also find that the positive effect of *vega* on the probability of debt issuance is present not only in under-levered firms, but also in over-levered firms, and that the two-day cumulative abnormal return around securities issue announcements is negatively related to the *vega* of CEOs at these issuing firms. These last two findings strongly support the conflict-of-interest conjecture, and cast doubt on the validity of the interest-alignment hypothesis.

Our evidence reinforces recent proposals to restrain stock options grants to senior executives and to replace stock options with restricted stock. However, it is not our intention to suggest that we eliminate stock options altogether, because as we mentioned earlier, there is ample empirical evidence on the positive shareholder-wealth effect of executive stock option holdings. Instead, we believe that setting an optimal level of executive stock option holdings is a delicate balancing act, involving trade-offs between various potential benefits and costs of using stock options. One of the costs, as we have shown, is that executives' stock option holdings weigh in the firm's debt-equity choice and induce the managers to prefer debt financing, even if it is not in the best interest of shareholders. Therefore, it is not necessarily "the more, the better" for shareholders in the case of equity-based compensation and particularly stock options.

Appendix 2.1. DELTA and VEGA of an executive's stock and stock option portfolio

A. DELTA and VEGA of a portfolio of stock options

We calculate the value of a call option, c, and the sensitivities of a call option's value to stock price and stock return volatility, $\partial c/\partial S$ and $\partial c/\partial \sigma$ respectively, using the Black-Scholes formula (Black and Scholes (1973)) for valuing European call options, as modified by Merton (1973) to account for dividend payouts.

$$c = Se^{-dT}N(Z) - Xe^{-rT}N(Z-\sigma T^{1/2}) \quad (1)$$

$$\partial c/\partial S = e^{-dT}N(Z) \quad (2)$$

$$\partial c/\partial \sigma = Se^{-dT}n(Z)T^{1/2} \quad (3)$$

where

$Z = (\ln(S/X) + T(r-d+\sigma^2/2))/(\sigma T^{1/2})$,

S = price of the underlying stock,

X = exercise price of the option,

T = time to maturity of the option in years,

r = natural logarithm of risk-free interest rate,

d = natural logarithm of expected dividend yield on the underlying stock over the life of the option,

σ = expected annualized stock-return volatility over the life of the option,

N(.) = c.d.f. of standard normal distribution, and

n(.) = p.d.f. of standard normal distribution.

Following the definitions in Core and Guay (2002), for a single call option, *delta* = change in the option's value per 1% increase in stock price

$= \partial c/\partial S \times (1\% \times S)$ (4)

vega = change in the option's value per 0.01 increase in annualized stock return volatility

$= \partial c/\partial \sigma \times 0.01$ (5)

For a portfolio of *N* stock options,

delta = change in the value of the option portfolio per 1% increase in stock price

$= \partial c/\partial S \times 1\% \times S \times N$ (6)

vega = change in the value of the option portfolio per 0.01 (or 1%) increase in annualized stock return volatility

$= \partial c/\partial \sigma \times 0.01 \times N$ (7)

B. DELTA and VEGA of an executive's fiscal-year-end option portfolio

We compute the value sensitivities (i.e., *delta* and *vega*) of each executive's fiscal-year-end option portfolio using the approximation method proposed by Core and Guay (2002). *ExecuComp* provides such details as size, exercise price, and time to maturity for each of the current year's option grants, but for previously granted options (exercisable or unexercisable), it merely gives aggregate size and realizable value (the potential gains from exercising all options on the fiscal year end price). Core and Guay's method is to estimate the exercise price and time to maturity for these options so that the formulae in section A can be applied.

1. We directly apply the above formulae to calculate the value sensitivities of each current- year option grant. The value sensitivities of the portfolio of newly granted options is the sum of the value sensitivities of each new grant.

2. After removing newly granted options, if any, from the fiscal-year-end option portfolio, we obtain a portfolio of previously granted options only. Some of these options are exercisable (vested) and others are un-exercisable (unvested). We compute the value sensitivities separately for the portfolio of exercisable options and the portfolio of un-exercisable options.

Exercise price: for each portfolio, we first divide the aggregate realizable value by the number of options in the portfolio, which gives the average of (stock price – exercise price). We then subtract this number from the stock price to arrive at the average exercise price.

Time to maturity: for un-exercisable options, we set the average time to maturity equal to one year less than the time to maturity of the current year's options grants, or equal to 9 years if no grant was made in the current year; for exercisable options, we set the average time to maturity as four years less than the time to maturity of the current year's options grants, or 6 years if no grant was made in the current year.

Using the imputed average exercise price and average time to maturity, we can apply the formulae in section A to calculate the value sensitivities of the two portfolios of previously granted options.

3. The value sensitivities of an executive's entire option portfolio is the sum of the value sensitivities of (i) the portfolio of newly granted options, (ii) the portfolio of previously granted, un-exercisable options, and (iii) the portfolio of previously granted, exercisable options.

C. DELTA and VEGA of an executive's fiscal-year-end stock and stock option portfolio

It is straightforward to see that the *delta* of one share of stock (common or restricted) is equal to 1% × S and that the *delta* of a portfolio of *N* shares of stock is equal to 1% × S × N.

Therefore, the *delta* of an executive's stock and stock option portfolio is equal to the sum of the *delta* of the stock portfolio and that of the stock option portfolio.

We ignore the *vega* of an executive's stock holdings since Guay (1999) finds that this value is negligible compared to the *vega* of stock options. As a result, the *vega* of the stock and stock option portfolio is simply the *vega* of the stock option portfolio itself.

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CHAPTER III

BANKERS ON BOARDS AND CEO EQUITY INCENTIVES: CONFLICT OF INTEREST

1. Introduction

Under their fiduciary duties of care and loyalty, the board of directors serve as the agents of shareholders to monitor and motivate managers so that managers behave in the best interests of shareholders. But what if there is a conflict of interest between shareholders and some of the directors? Are these conflicted directors still going to look after the best interests of the shareholders? Perhaps not.

In this paper, we focus on one particular type of directors whose interests are most likely at odds with those of the shareholders: directors whose main employers are commercial banks. Following Kroszner and Strahan (2001), we call such directors "banker directors" and firms with banker directors "banker firms". Among the largest non-financial corporations in the U.S., about one third have one or more banker directors on their boards (Kroszner and Strahan (2001), Table I). As we discuss in more detail in the next section, these banker directors have both the incentive and the power to influence important board decisions in ways that are not necessarily in the best interests of the shareholders of banker firms. In particular, we investigate how the presence of banker directors affects a firm's CEO compensation policy, one of the most important responsibilities of a corporate board.

Five factors may generate the tension between banker directors and banker firms' shareholders: (i) the regulatory obstacle for significant equity holdings by commercial banks employing these banker directors, (ii) the conflict of interest between shareholders and creditors (Jensen and Meckling (1976)), (iii) the lender liability and equitable subordination provisions in the pro-shareholder U.S. bankruptcy doctrine (see, e.g., Fischel (1989), Roe (1994), and Kroszner and Strahan (2001)), (iv) the disinclination of banker directors to be associated with financial distress for fear of punishment by the market for directorships, and (v) the fact that banker directors' personal wealth and career concerns are mostly tied up in the well being of their own banks dictates that if there is a conflict of interest, they will side with their banks at the expense of the shareholders of banker firms.[38]

To banker directors facing these conflicts, designing the compensation package and setting the level of equity incentives for CEOs presents a challenge. On the one hand, they ought to fulfill their fiduciary duty as directors and align the interests of CEOs with those of shareholders through the use of equity-based compensation, including common or restricted stock and stock options. On the other hand, they are aware of the consequences of doing so, that such aligned CEOs would likely take on risky projects that solely benefit shareholders while expropriating creditors and increasing the probability of financial distress. Because of the sources of tension previously mentioned, we conjecture that the end result of this *inner* struggle is that banker directors curb CEOs' equity-based compensation to reduce their incentives to pursue high-risk strategies and engage in asset substitution. In short, we expect that the presence of banker directors has a negative impact on the level of CEO equity incentives.

An analysis of 339 firms in 1992 indicates that the level of CEO equity incentives is significantly lower at firms with bankers on boards, supporting the above hypothesis. In addition, we find as corroborating evidence that the magnitude of the negative effect of bankers on boards is an increasing function of firm risk. This is consistent with the conjecture that the conflict of interest between banker directors and shareholders of banker firms is more severe at more risky firms since banker directors are more worried about the lender liability and asset substitution problems at these firms.

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[38] We recognize that there may be agency conflict between the shareholders of commercial banks and banker directors, who are usually top executives of these banks. However, to the extent that these executives extract the private benefit of control mostly from their banks and that the private benefits of control they can possibly enjoy are proportional to the banks' total asset value, they will try to maximize the size of the pie first. How the pie is divided between bank executives and bank shareholders is irrelevant to the shareholders of banker firms.

Our results also suggest that banker directors have stronger influence over the level of CEO equity incentives when they sit on smaller boards and when they have longer board tenure. The first finding is consistent with the intuition that it is easier in a smaller board for a banker director to persuade other board members, outside members in particular, to go along with her preference regarding CEO compensation, given that the approval by the full board is usually needed in setting CEO pay. The second finding is also intuitive since it takes time for a banker director to exert influence on CEO compensation and gradually have her influence felt.

In further analysis, we employ two econometric approaches to rule out the possibility that our findings are driven by the endogeneity of firms having bankers on boards. More specifically, it does not appear that the level of CEO equity incentives is lower at firms with banker directors *because* commercial bankers are more likely to join the boards of firms whose CEOs have lower equity incentives.

The remainder of the paper is organized as follows. Section II discusses in more detail the incentives of banker directors and lays out our main hypothesis. Section III briefly reviews related literature. Section IV describes the sample and variables construction and section V presents the empirical results. Section VI concludes.

2. Conflict of interest between shareholders and banker directors

2.1. Jensen and Meckling's (1976) conflict of interest between shareholders and creditors

Different payoff structures associated with debt and equity claims are the fundamental source of the conflict of interest between shareholders and creditors (Jensen and Meckling (1976)). This conflict could be mitigated if creditors can also become shareholders by holding equity stakes in borrowing firms. However, under the U.S. regulations, e.g., the 1933 Glass-Steagall Act, banks are generally not allowed to own equity in non-financial companies, which makes the tension between shareholders and creditors in the U.S. more acute than in other developed countries such as Germany and Japan.

Banker directors on the boards of non-financial firms are essentially playing the role of "double agents". On the one hand, these banker directors are usually CEOs or top executives at commercial banks and thus have the fiduciary duty to serve the best interests of bank shareholders; on the other hand, they are board members of non-financial firms, and under the fiduciary duty of directors, they are supposed to serve the best interests of the shareholders at banker firms. Now the interesting question is "when there is a conflict of interest between their banks and banker firms, whose side will the banker directors take?" If banker directors chose to side with the shareholders of banker firms, then there would be no conflict of interest between banker firms' shareholders and banker directors even if one exists between these shareholders and banks. However, this is unlikely to be the case since in reality the personal wealth and career concerns of banker directors are more closely related to the well being of their bank-employers than firms for which they merely serve as outside directors. Therefore, it is more reasonable to assume that when there is a conflict of interest, these banker directors will choose to protect or enhance the welfare of their bank-employers at the expense of banker firms' shareholders.

When there is an identifiable lending relationship, which may take the form of a line of credit, a syndicated loan, etc., between a banker firm and its banker director's bank-employer, the conflict-of-interest arguments in Jensen and Meckling (1976) readily apply. To the extent that a majority of firms with banker directors have lending relationship with their banker directors' banks and that a lending relationship, even if non-existent for the time being, may potentially develop as suggested by Kroszner and Strahan (2001), the conflict of interest faced by banker directors seems pervasive.[39] To protect their banks' loan assets from the expropriation by banker firms' CEOs acting in the best interests of shareholders, banker directors could either vigilantly

[39] Kroszner and Strahan (2001) demonstrate that over 60% of banker firms have some lending relationship with their banker directors' bank-employers.

monitor CEOs' actions, which is potentially time consuming and difficult to implement given the informational disadvantage faced by banker directors, or influence CEOs' equity incentives to reduce their tendency to expropriate, which is subtler, less costly, and perhaps more effective since it works from *within*. The incentives of banker directors coupled with the power that board members naturally possess jointly predict that the presence of banker directors has a negative effect on CEO equity incentives.

2.2. Financial distress and lender liability

There are two more dimensions in our conflict-of-interest hypothesis, neither of which necessarily involves the expropriation of creditors by shareholders that is essential for the preceding arguments.

One of them finds its root in the pro-shareholder U.S. legal and regulatory regimes, and in particular, the U.S. bankruptcy doctrines of equitable subordination and lender liability. The equitable subordination and lender liability provisions in the U.S. bankruptcy codes aim to protect shareholders and junior creditors from the opportunistic behavior of senior creditors in cases where banks, usually the senior claimants, "are judged to have taken actions that improve their positions at the expense of other claimants" (Kroszner and Strahan, 2001, p. 416) in the process of firm failure. Kroszner and Strahan (2001, p. 431) also note that "being on the board but not having direct lending relationship does not completely insulate a bank from lender liability".[40] As argued by Fischel (1989) and Roe (1994) and empirically shown by Kroszner and Strahan (2001), such a system deters banks from actively participating in the management of financially distressed firms prior to formal bankruptcy filings and bankers are more inclined to serve on the boards of large and stable firms where the risk of experiencing financial distress and incurring lender liability is relatively low. Taking the prior arguments one step further, we hypothesize that once bankers begin to serve on corporate boards, they will take further actions to minimize the

[40] See, e.g., In re Allegheny International, Inc., 118 B. R. 282 (1990).

probability of financial distress and the threat of lender liability. To the extent that equity incentives induce managerial risk taking, which increases the probability of financial distress, banker directors will try to institute a lower level of equity incentives, even if a higher level would be value-maximizing for the diversified shareholders of banker firms.

2.3. The market for directorships and the job as a bank executive

In addition to unfavorable bankruptcy doctrines, there is another element that discourages banker directors from being associated with financially distressed firms and the disinclination on the part of banker directors may induce them to reduce the CEO's equity incentives at banker firms. This third facet of our conflict-of-interest hypothesis can be traced back to the peculiar attributes and requirement of the main jobs of banker directors as CEOs or top executives of commercial banks. As Diamond (1984) notes, banks are in the business of relationship building, information gathering, and monitoring. Therefore, "bank executives have an incentive to be more willing to supply their services as directors than their counterparts in non-financial firms, as outside directorships provide information about potential borrowers, about the industry in which the firms are operating, and about executives from other firms also sitting on the board" (Kroszner and Strahan, 2001, p.419-420). In fact, there is evidence that bank executives do hold a significantly larger number of outside board memberships than executives of other backgrounds (see the Appendix of Kroszner and Strahan, 2001). It seems that securing outside board memberships, as part of expected duties, is more important to bank executives than executives of non-financial companies.

Related research shows that the market for directorships punishes associations with firm failures or extremely poor performance. In particular, Gilson (1990) finds that outside directors who leave the boards of financially distressed firms hold approximately one-third fewer directorships three years after their departure from the distressed firms. To the extent that banker directors value outside board memberships more than directors of other background do, and they have more to lose since they hold more board seats, they will have an *extra* incentive to avoid financial distress. In doing so, they may choose to curtail the level of managerial equity incentives in an attempt to dampen managers' risk-taking appetite.

3. Related literature

Outsider board members, most of whom are independent of firm management, are often deemed as guardians of shareholder wealth against managerial expropriation, but it is not automatic that they will serve the best interests of the shareholders. Whether they indeed do so or not and why have been the subject of a number of studies. From the perspective of career concern, Fama and Jensen (1983) argue that outside directors have incentives to become effective monitors of the management because they want to develop reputations as experts in decision control and their performance as directors is positively related to the value of their human capital as decisions managers in other organizations. Extending the managerial labor market ex-post settling-up theory developed by Fama (1980), Harford (2003) contend that such settling-ups exist in the directorship market as well and that the prospect of being punished by the market for corporate directorships makes outside directors more alert to managerial actions harmful to shareholders.

Direct financial concerns may also prompt outside directors to act in the best interests of shareholders. Board members holding more equity incentives tend to make value-enhancing decisions for shareholders. For example, Perry (2000) shows that the probability of CEO turnover is more sensitive to firm performance when boards are paid with incentives, suggesting that providing explicit incentives to directors leads them to make better decisions.

However, all is not well with the incentives of outside directors. Focusing on the boards of firms targeted for takeovers, Harford (2003) finds that outside directors have both financial and non-financial considerations to resist takeover bids even when the bids are shareholder-value enhancing. Our paper is similar in spirit to Harford (2003) in that we show that one type of outside board members, i.e., banker directors, has interests divergent from those of the shareholders, and this incentive misalignment manifests itself in the level of CEO equity incentives.

Numerous papers have examined how boards accomplish some of their main responsibilities such as overseeing CEO successions or turnovers, making takeover-related decisions, and designing executive compensation packages. Two recent reviews by Bhagat and Black (1999, p.4-17) and Hermalin and Weisbach (2002, p.15-24) provide detailed coverage and discussions of the existing literature that we will not attempt to reproduce here. Most of these papers take a macro approach toward boards by looking at either the percentage of outside directors on boards or the size of boards. In contrast, we take a more micro-economic perspective in that we recognize the heterogeneity in the incentives of outside directors and focus on one type of directors whose interests are most likely to clash with those of the shareholders they are supposed to serve.

4. Sample Construction and Model Specification

4.1. Sample description

Our initial sample comprises 773 firms on the 1992 Forbes 500 lists provided by Kevin Hallock (see Hallock (1997, 1999)). Every year, the Forbes magazine compiles four lists of the largest 500 firms ranked on sales, profits, assets and market value, respectively. The 773 firms together have about 9000 directors, for which Hallock collected their names and main employers from these firms' year-1992 annual reports and proxy statements. We use this information to determine whether a firm has bankers on its board and construct some other board characteristics, such as the size and the insider percentage of the board and the presence of interlocking directors. We obtain a sample of 430 firms after excluding financial firms (with 4-digit SIC between 6000 and 6999), and firms that do not have financial statement information from COMPUSTAT or stock return data from the Center for Research in Securities Prices (CRSP).[41] This smaller sample is the same as that used in Kroszner and Strahan (2001). We then delete firms without year-1992 compensation data for their CEOs in the Standard & Poor's *ExecuComp* database.[42] Our final sample consists of 339 companies, of which 106 (about 31.3%) have one or more bankers on their boards. Over forty industries defined by the 2-digit SIC codes are represented in the sample, and approximately two thirds of the firms are from the manufacturing sectors (with 4-digit SIC between 2000 and 3999).

4.2. Measuring CEO equity incentives

Our measure of CEO equity incentives is the change in the dollar value of the CEO's entire stock and option portfolio per $1,000 increase in the shareholder value. This definition has been used in many other studies such as Demsetz and Lehn (1985), Jensen and Murphy (1990) and Yermack (1995). John and John (1993) theoretically show that managers with higher equity incentives defined in this manner are more likely to engage in assets substitution to expropriate debt holders. Both Agrawal and Mandelker (1987) and Berger, Ofek, and Yermack (1997) provide empirical evidence that managers with more equity incentives similarly defined are more likely to take greater risk.

The incentives from common equity and restricted stock are easy to compute, because the value of each share of stock changes by $1 as the stock price changes by $1.[43] For the incentives from stock options, we follow the procedure in Core and Guay (2002), which has been employed by a number of recent studies such as Jin (2002), Rajgopal and Shevlin (2002), and Coles, Daniel,

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[41] To be consistent with Kroszner and Strahan (2001), we do not exclude from our final sample firms in the utility industries. Nevertheless, we obtain qualitatively the same results when we do exclude them.

[42] Following Core and Guay (1999), we identify the executive with the highest total compensation as the CEO when ExecuComp does not explicitly indicate which executive is the CEO.

[43] Strictly speaking, the value of each share of restricted stocks changes by less than $1 when the stock price changes by $1, since it is not readily tradable as the CEO's common equity holdings. But unfortunately, the literature has yet to come up with a satisfactory method to address this concern, and we believe the resulting deviation to be minor and inconsequential.

and Naveen (2004). The CEO's total equity incentives are then the sum of the incentives from common equity and restricted stock and those from stock options.

4.3. Variable construction and model specification

We create a binary variable which is equal to one if a firm has a banker on its board or zero otherwise, and denote it as ***BonB***, the abbreviation for "banker on board". We expect it to have a negative coefficient in regressions of CEO equity incentives. To investigate whether banker directors who are also members of the compensation committees have enhanced power to influence CEO equity incentives, we create another binary variable that is equal to one if a firm has a banker director on its compensation committee or zero otherwise, and denote it as ***BonC***, the abbreviation for "banker on committee".[44] We also control for other determinants of CEO equity incentives. They include proxies for firm size, costs and difficulties of monitoring, CEO tenure, board structure, and unobservable industry-wide characteristics.

The equity incentive measure we use is essentially a CEO's effective percentage ownership in her own firm, where her holdings of stock options are converted into effective holdings of her firm's stock by invoking the Black-Scholes-Merton option pricing formula and its first derivative with respect to the stock price. Firm size has been identified by many researchers as an important determinant of CEO equity incentives. Demsetz and Lehn (1985), for example, show that managerial percentage ownership is negatively related to firm size due to managerial wealth constraints. We measure firm size by the logarithmic transformation of market value of equity. We also experiment with the logarithmic transformation of net sales or the book value of total assets and obtain essentially the same results (not reported).

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[44] For the 106 firms with bankers on board, we determine from their proxy statements that a little more than 50% of them have banker directors on their compensation committees for year 1992. The compensation committees of the banker firms in our sample have 4 to 5 members on average. In most cases all members are outside directors. If there are any insiders (usually the CEO or the chairman) on the committee, they will recuse themselves when the committee determines their compensations. We do not have information on the compensation committees for all sample firms.

Demsetz and Lehn (1985) also find that managerial percentage ownership is higher at firms operating in noisier or less predictable environments, consistent with their hypothesis that the benefit of concentrated ownership is larger at firms where it is more difficult or costly to actively monitor the CEO. They also argue that due to managerial risk aversion, the ownership level will increase in firm volatility at a decreasing rate. Core and Guay (1999) present evidence confirming the conjecture. We measure firm volatility by the monthly stock return volatility over the past five years. In addition to ***volatility*** itself, we also include its quadratic form, ***volatility-squared***, in the list of regressors to capture the idea that CEO equity incentives is a concave function of firm volatility. Our results remain unchanged if we follow Core and Guay (1999) and use the logarithmic transformation of the return volatility in place of ***volatility*** and ***volatility-squared***.

Along the lines of Demsetz and Lehn, Smith and Watts (1992) suggest that it is more difficult to monitor and evaluate the CEO's actions in firms with more investment opportunities and that in these firms, the misalignment of interest between the CEO and the shareholders are more costly. They predict and find a positive relationship between a firm's growth opportunities and the degree to which the firm uses equity incentives to tie its CEO's wealth to shareholder value. Following Smith and Watts (1992), we use a firm's ***Tobin's Q***, i.e., the ratio of the market value of total assets to the book value of total assets, as a proxy for its growth opportunities.

Core and Guay (1999) and Palia (2001) both find a positive relationship between CEO tenure and the level of equity incentives. Following Core and Guay, we use the logarithmic transformation of ***CEO tenure*** as a proxy for a CEO's potential horizon problem and the uncertainty about her ability and experience. The reasoning is as follows. The longer the CEO has been in her position, the more assured the board of directors is about her ability and experience, and the less likely they will fire her. Sensing a higher job security, the CEO will be less motivated to work hard, and greater equity incentives are necessary to make up for the lost incentive. The horizon problem occurs when the CEO has been on the job for a long time and is close to retirement. Since she may not be able to benefit from actions that improve her firm's long-term profitability, myopic decisions are more likely to be made in pursuit of near-term, transient prosperity. More equity incentives in the forms of restricted stock or stock options that will be vested over an extended period are able to counter this problem.

Yermack (1996) reports that smaller boards tend to set higher pay-performance sensitivities for CEOs. We measure board size by the number of directors. Mehran (1995) shows that boards with a higher percentage of outside directors are heavier users of equity-based compensation in the CEO's total pay. We control for the percentage of inside directors on each board. In adding ***board size*** and ***insider percentage*** of the board to the list of explanatory variables, we are aware of the possibility that they might not be entirely exogenous and rather reflect the outcomes of firms' value-maximizing activities. We address this concern in Section V.

Finally, we generate industry dummy variables based on two-digit SIC codes to capture any unobservable industry-wide forces affecting CEO equity incentives. Our baseline regression model for CEO equity incentives is specified as follows:

$$\begin{aligned}\text{Log}\,(1+\textit{equity incentives}) = {} & \beta_0 + \beta_1\, \textit{BonB} + \beta_2\, \textit{BonC} + \beta_3\, \textit{board size} + \beta_4\, \textit{insider percentage} \\ & + \beta_5 \log(\textit{market value of equity}) + \beta_6\, \textit{volatility} + \beta_7\, \textit{volatility-squared} \\ & + \beta_8\, \textit{Tobin's Q} + \beta_9 \log(\textit{CEO tenure}) + \beta_{10}\, \textit{industry controls} + \varepsilon \qquad (1)\end{aligned}$$

where we use the logarithmic transformation of CEO equity incentives as the dependent variable, in order to get rid of the severe skewness in the original incentive measure.[45]

Panel A of table I presents the descriptive statistics of the variables in equation (1). As we just mentioned, the distribution of CEO equity incentives is highly skewed in that the median CEO's financial wealth increases by $4.29 per $1,000 increase in shareholder value, while the

[45] The coefficient estimate of BonB is negative and statistically more significant if the dependent variable is the un-transformed CEO equity incentives.

Table 3.1. Summary statistics

The table presents the descriptive statistics, results from univariate analyses, and the cross correlations in Panels A, B, and C, respectively. We define e*quity incentives* as the dollar change in the CEO's financial wealth in the form of stock and stock option holdings at the end of year 1992 per $1,000 change in the shareholder value. *BonB* is a binary variable equal to 1 if a firm has at least one banker director on its board in 1992 or zero otherwise. *Boar size* is measured by the number of directors on the board during 1992. *Insider percentage* is the proportion of inside directors on the board. The book value of *total assets* is measured at the end of year 1992. *Volatility* is computed as the variance of the monthly stock return over a five-year period from 1998 to 1992. *Tobin's Q* is calculated as (book value of total assets - book value of common equity + market value of common equity)/book value of total assets. *CEO tenure* is the number of years the current CEO has been in office. Statistical significance at the 10%, 5%, and 1% levels is indicated by $^{+}$, $^{++}$, and $^{+++}$, respectively.

Panel A: Descriptive Statistics

Variables	Mean	Std. Dev.	Q1	Median	Q3
Equity incentives	$23.36	$58.14	$1.63	$4.29	$12.59
Log (1+*equity incentives*)	1.94	1.37	0.97	1.67	2.61
BonB	0.31	0.46	0	0	1
Board size	11.96	3.10	10	12	14
Insider percentage	27.29%	12.40%	18.18%	25.00%	33.33%
Total assets (in millions)	$7,706	$19,599	$1,412	$2,882	$6,552
Log (*total assets*)	8.11	1.13	7.25	7.97	8.78
Net sales (in millions)	$6,606	$12,293	$1,690	$2,922	$7,007
Log (*net sales*)	8.11	1.09	7.43	7.98	8.85
Market equity (in millions)	$5,919	$9,587	$1,563	$2,732	$5,536
Log (*market equity*)	8.05	1.06	7.35	7.91	8.62
Volatility	28.63%	10.69%	21.00%	26.60%	33.30%
Tobin's Q	1.98	1.34	1.23	1.51	2.20
CEO tenure	8.52	7.31	4	6	11
Log (*CEO tenure*)	1.80	0.86	1.39	1.79	2.40

Table 3.1 (Cont'd)

Panel B: Univariate Analysis						
Variables	*BonB*=0		*BonB*=1		Difference	
	Mean	Median	Mean	Median	t-stat	z-stat
Equity incentives	$31.30	$5.03	$5.90	$3.22	5.57^{+++}	3.40^{+++}
Log (1+*equity incentives*)	2.14	1.80	1.49	1.44	4.99^{+++}	3.40^{+++}
Board size	11.35	11.00	13.31	14.00	-5.98^{+++}	-5.77^{+++}
Insider percentage	29.35%	27.27%	22.75%	21.43%	5.07^{+++}	4.50^{+++}
Market value (in millions)	$4,753	$2,475	$8,484	$3,613	-2.81^{+++}	-3.39^{+++}
Log (*market equity*)	7.90	7.81	8.37	8.19	-3.85^{+++}	-3.39^{+++}
Volatility	29.94%	27.60%	25.76%	24.40%	3.94^{+++}	2.90^{+++}
Tobin's Q	2.04	1.52	1.85	1.50	1.36	0.84
CEO tenure	8.66	6.00	8.21	7.00	0.57	-0.40
Log (*CEO tenure*)	1.80	1.79	1.81	1.95	-0.10	-0.40

Panel C: Correlation Matrix								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Log (1+equity incentives)	1.00^{+++}							
(2) *BonB*	-.22^{+++}	1.00^{+++}						
(3) *Board size*	-.42^{+++}	.29^{+++}	1.00^{+++}					
(4) *Insider percentage*	.26^{+++}	-.25^{+++}	-.13^{++}	1.00^{+++}				
(5) Log (*market equity*)	-.30^{+++}	.21^{+++}	.41^{+++}	-0.05	1.00^{+++}			
(6) *Volatility*	.39^{+++}	-.18^{+++}	-.39^{+++}	.15^{+++}	-.38^{+++}	1.00^{+++}		
(7) *Tobin's Q*	.23^{+++}	-.07	-.22^{+++}	.13^{++}	.28^{+++}	.05	1.00^{+++}	
(8) Log (*CEO tenure*)	.41^{+++}	.01	-.17^{+++}	.09^{+}	-.07	.06	.10^{+}	1.00^{+++}

CEO's equity incentive on average is much higher at $23.36 per $1000. The logarithmic transformation removes most of the skewness of the original incentive measure, and the distribution of log(1+*equity incentives*) is much more symmetric and closer to normal. One hundred and six, about 31%, of our sample firms have commercial bankers on their boards, and 55% of banker firms (58 out of 106) also have commercial bankers on their compensation committees. The median board has 12 members and most of our firms have an outsider-dominated board in that the 3rd quartile of the insider percentage on the board is only about 33%. The mean (median) book value of total assets for our sample is $7.71 (2.88) billion, substantially higher than that of the average firm in COMPUSTAT and reflecting the *Forbes* 500 status of our sample firms. The Tobin's Q is greater than 1 for over 75% of our sample, indicating that most of the firms have profitable investment opportunities. The median CEO has been in the office for 6 years.

The univariate analysis results reported in panel B of table I show that firms with bankers on boards are drastically different in a number of dimensions from firms without. Consistent with the findings in Kroszner and Strahan (2001), firms with bankers on boards are larger and less risky. More importantly, in support of our conflict-of-interest hypothesis, we find that CEO equity incentives are much lower at firms with bankers on boards than at those without. The correlation results in panel C also indicate that the *BonB* dummy is significantly negatively correlated with CEO equity incentives, with a correlation coefficient of -0.22 significant at the 0.001 level. Albeit revealing, these results do not allow us to draw reliable inferences, since neither the univariate analysis nor the simple correlation takes into account the correlations among explanatory variables. Therefore, we turn our attention to the multivariate regression analysis.

5. Empirical Results

5.1. Regression results of the baseline model

Table II presents the results of OLS regressions of CEO equity incentives. We estimate several variations of equation (1) and the adjusted-R^2 is consistently above 40%, suggesting that our model captures a substantial portion of the variation in CEO equity incentives. Consistent with our earlier predictions and the findings in other studies, e.g., Core and Guay (1999), Core et al. (1999), and Yermack (1996), we find that the CEO equity incentive is positively related to CEO tenure and Tobin's Q, negatively related to firm size and board size, and increasing in volatility at a decreasing rate. The positive relationship between the equity incentive and insider percentage of the board is in line with the result in Core, Holthausen, and Larcker (1999) that CEOs earn lower levels of compensation in firms where the insider percentage of the board is higher, but is somewhat at odds with the evidence in Mehran (1995) that CEOs at firms with more outsiders on their boards receive a higher percentage of total pay in equity-based forms. The discrepancy could be due to sample differences or the fact that we use a different dependent variable than he does.

More importantly, we find that *BonB* has a significantly negative coefficient whenever it is included as an explanatory variable, implying that banker on board has a negative effect on CEO equity incentives. This lends strong support to our main hypothesis that banker directors try to lower the level of CEO equity incentives, due to their conflict of interest with the shareholders of firms with banker directors. The impact of banker on board is not only statistically significant, but also economically so. For instance, the economic translation of the coefficient of BonB in column (5) is that ceteris paribus, bankers on boards reduce CEO equity incentives by about 21.3%.[46]

We also find in column (4) that *BonC* has an insignificant coefficient with *p*-value equal to 0.592 and that its inclusion in the regression equation only causes a multi-collinearity problem

[46] Since the dependent variable in the OLS regressions is the logarithmic transformed equity incentives, the economic impact of banker on board on the un-transformed equity incentives is computed as $1-e^{-0.239}=1-0.787=0.213=21.3\%$.

Table 3.2. OLS regression results for the baseline model

The table presents the estimation results of a number of variations of the baseline model specified by equation (1). All variables are as defined in table I. Coefficient estimates of the industry dummies are not reported for brevity consideration. Two-sided *p*-values reported in the parentheses are computed based on the White's (1980) heteroskedasticity-consistent standard errors.

Independent variables	Coefficient estimates (p-values)				
	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)
Intercept	4.328 (0.000)	3.934 (0.000)	4.048 (0.000)	4.028 (0.000)	3.803 (0.000)
BonB			-0.364 (0.001)	-0.409 (0.007)	-0.239 (0.029)
BonC				0.083 (0.592)	
Board size		-0.059 (0.014)			-0.051 (0.038)
Insider percentage		0.014 (0.006)			0.012 (0.017)
Log (*market equity*)	-0.307 (0.000)	-0.238 (0.000)	-0.275 (0.000)	-0.274 (0.000)	-0.226 (0.000)
Volatility	9.225 (0.000)	8.899 (0.000)	9.561 (0.000)	9.573 (0.000)	9.163 (0.000)
Volatility-squared	-8.456 (0.013)	-8.662 (0.008)	-9.108 (0.008)	-9.121 (0.008)	-9.062 (0.006)
Tobin's Q	0.203 (0.001)	0.150 (0.014)	0.187 (0.002)	0.188 (0.002)	0.147 (0.016)
Log (*CEO tenure*)	0.522 (0.000)	0.494 (0.000)	0.531 (0.000)	0.534 (0.000)	0.504 (0.000)
Industry controls	Included	Included	Included	Included	Included
Number of observations	339	339	339	339	339
Adjusted-R^2	40.78%	43.28%	42.06%	41.91%	43.69%

and does not increase the explanatory power of the model.[47] This suggests that banker directors who are not on the compensation committees are equally capable of influencing firms' CEO compensation policy as those who are, consistent with the way in which corporate boards operate in structuring executive compensation and incentives, i.e., compensation committees are only responsible for preparing a proposal or recommendation to the board and the full board makes adjustments to and final decisions on the proposal or recommendation. Besides, despite the attention paid to compensation committees by the popular press, the extant evidence on the role and importance of compensation committees is sparse and mixed at best. For example, Vafeas (2003) find that insider presence on compensation committees affects neither the level of CEO compensation nor the sensitivity of CEO compensation to performance. Anderson and Bizjak (2003) do not find any relation between compensation committee independence and executive pay. Newman and Mozes (1999) find no evidence that CEO pay is higher when there is insider presence on the compensation committee, but they do find that the sensitivity of CEO pay to poor performance is weaker when there are insiders on compensation committees.

As we mentioned earlier, one concern regarding the above estimations is that we treat the size and the insider percentage of the board as exogenous in the OLS regressions, while either of them could be the outcome of firms' optimizing activities and thus be endogenously determined. This endogeneity might bias the coefficient estimates or even drive our results. Therefore, we also removed board size and insider percentage from our regression and re-estimated the modified model. We report the results in column (3) and find that the coefficient of *BonB* is still significantly negative, and that there are no qualitative changes to the coefficients of other variables.

5.2. Further tests of the conflict-of-interest hypothesis

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[47] To see this, compare the adjusted-R2 between the two models estimated in columns (3) and (4), respectively. The inclusion of BonC in column (4) results in a slight decrease in the adjusted-R2, without qualitatively changing the coefficient estimate of any other explanatory variable.

5.2.1. Interacting BonB with board size and firm risk

Since it may be easier in smaller boards for banker directors to persuade other board members to go along with their preference regarding CEO compensation, we expect the influence of banker directors to be stronger and more detectable in firms with smaller boards. However, it is also possible that banker directors could have their way more easily in larger boards, since larger boards have coordination and free-rider problem (Yermack (1996)). To investigate these two possibilities, we create a binary variable that is equal to zero if the board size of a firm is above the sample median or one otherwise, and denote it as ***small board***. We then generate a multiplicative interaction term set equal to the product of ***BonB*** and ***small board***, and expect this interaction term to have a negative coefficient in the regressions of equity incentives.

We create another binary variable, denoted as ***high risk***, that is equal to one if the volatility of a firm is above the sample median or zero otherwise, and another multiplicative interaction term between ***BonB*** and ***high risk***.[48] This second interaction term will be negatively related to equity incentives if the conflict of interest between banker directors and the shareholders of firms with banker directors intensifies as firm risk increases. The augmented regression equation for CEO equity incentives is specified as follows:

$$
\begin{aligned}
\text{Log}\,(1+\textit{equity incentives}) = {} & \beta_0 + \beta_1\,\textit{BonB} + \beta_2\,\textit{BonB} \times \textit{small board} + \beta_3\,\textit{BonB} \times \textit{high risk} \\
& + \beta_4\,\textit{board size} + \beta_5\,\textit{insider percentage} + \beta_6 \log\,(\textit{market value of equity}) \\
& + \beta_7\,\textit{volatility} + \beta_8\,\textit{volatility-squared} + \beta_9\,\textit{Tobin's Q} \\
& + \beta_{10} \log\,(\textit{CEO tenure}) + \beta_{11}\,\textit{industry controls} + \varepsilon \qquad (2)
\end{aligned}
$$

[48] Rather than creating the two binary variables, large board and high risk, we could have interacted *BonB* directly with volatility and board size, respectively. However, the multiplicative interaction terms so generated cause the multi-collinearity problem in the OLS regressions. So we opt for the current version of the interaction term.

The estimation results reported in table III confirm our predictions. Both interaction terms have significantly negative coefficients, regardless of whether they are included in the regression one by one as in columns (1) and (2) or together as in column (3). Results on other explanatory variables are largely the same as in table II.

5.2.2. Does director tenure matter?

We also explore whether the effect of *BonB* is a function of a banker director's tenure on the board. A priori, tenure should matter, but by no means its effect has to be linear. It is an empirical question as to (i) how long banker directors need to be on the board before they are able to influence CEO equity incentives and (ii) whether there is a point on the continuum of board tenure after which additional time served on the board would not give directors more power to influence CEO incentives. We divide the 106 banker firms into four groups based on whether their banker directors' board tenure is in the 1st, 2nd, 3rd, or 4th quartile. The 25th, 50th, and 75th percentiles of banker directors' board tenures are 4 years, 7 years, and 15 years, respectively. For each quartile, we create an indicator variable that is equal to 1 for firms in that quartile and zero otherwise. We replace the *BonB* dummy with four indicator variables, i.e., ***quartile1*** ~ ***quartile4*** (with *quartile1* representing the shortest-tenure quartile and *quartile4* the longest-tenure quartile), and present the coefficient estimates of the new model in Table IV.

We find that the negative effect of banker directors in the bottom tenure quartile is insignificant with a *p*-value of 0.660, while the negative effects of banker directors in the top three tenure quartiles are all significant (although ***quartile3*** is only significant at the 10% level based on one-sided *p*-value) and close in magnitude (see Column (1)). When we group the top 3 quartiles into one group and re-estimate the CEO equity incentive regression, the ***quartile1*** dummy is still insignificant, while the ***quartile234*** dummy, which is equal to 1 for banker firms in the top three tenure quartiles and zero otherwise, is significantly negative (see Column (2)). These results suggest that the previously identified negative effect of bankers on boards is mostly

Table 3.3. Interacting *BonB* with board size and firm risk

The table presents the estimation results of a number of variations of the refined model specified by equation (2). *Small-board dummy* is set equal to one if the board of a firm is smaller than the sample median or zero otherwise. *High-risk dummy* is set equal to one if a firm's *volatility* is higher than the sample median or zero otherwise. All other variables are as defined in previous tables. Coefficient estimates of the industry dummies are not reported for brevity consideration. Two-sided *p*-values reported in the parentheses are computed based on the White's (1980) heteroskedasticity-consistent standard errors.

Independent variables	Coefficient estimates (p-values)		
	Column (1)	Column (2)	Column (3)
Intercept	3.969 (0.000)	3.509 (0.000)	3.680 (0.000)
BonB	-0.080 (0.689)	-0.065 (0.594)	0.062 (0.601)
BonB × *small-board dummy*	-0.357 (0.069)		-0.317 (0.099)
BonB × *high-risk dummy*		-0.409 (0.019)	-0.376 (0.030)
Board size	-0.065 (0.019)	-0.048 (0.054)	-0.060 (0.030)
Insider percentage	0.012 (0.018)	0.012 (0.019)	0.012 (0.020)
Log (*market equity*)	-0.231 (0.000)	-0.235 (0.000)	-0.238 (0.000)
Volatility	9.005 (0.000)	10.933 (0.000)	10.651 (0.000)
Volatility-squared	-8.994 (0.005)	-11.077 (0.001)	-10.854 (0.002)
Tobin's Q	0.147 (0.017)	0.142 (0.020)	0.142 (0.020)
Log (*CEO tenure*)	0.504 (0.000)	0.502 (0.000)	0.503 (0.000)
Industry controls	Included	Included	Included
Number of observations	339	339	339
Adjusted-R^2	43.92%	44.06%	44.21%

Table 3.4. Uncovering the tenure effect

Quartile1 (2, 3, and 4) is equal to 1 for firms whose banker directors' board tenure is in the 1st (2nd, 3rd, and 4th) quartile and 0 otherwise. *Quartile234* is equal to 0 for firms whose banker directors' board tenure is in the 1st quartile and 1 otherwise. All other variables are as defined in previous tables. Coefficient estimates of the industry dummies are not reported for brevity consideration. Two-sided *p*-values reported in the parentheses are computed based on the White's (1980) heteroskedasticity-consistent standard errors.

Independent variables	Coefficient estimates (p-values)	
	Column (1)	Column (2)
Intercept	3.791 (0.000)	3.803 (0.000)
Quartile1 (shortest tenure)	-0.069 (0.660)	-0.069 (0.659)
Quartile2	-0.308 (0.066)	
Quartile3	-0.255 (0.153)	
Quartile4 (longest tenure)	-0.315 (0.089)	
Quartile234		-0.291 (0.018)
Board size	-0.052 (0.046)	-0.052 (0.044)
Insider percentage	0.012 (0.024)	0.012 (0.022)
Log (*market equity*)	-0.223 (0.001)	-0.223 (0.001)
Volatility	9.095 (0.000)	9.038 (0.000)
Volatility-squared	-8.979 (0.009)	-8.909 (0.009)
Tobin's Q	0.149 (0.019)	0.148 (0.019)
Log (*CEO tenure*)	0.507 (0.000)	0.507 (0.000)
Industry controls	Included	Included
Number of observations	339	339
Adjusted-R^2	43.29%	43.63%

driven by banker directors who have been on their respective boards for four years or longer and that more time served on the boards after four years does not appear to give banker directors more power to influence CEO equity incentives.

Overall, the evidence presented so far is strongly supportive of our conjecture that the conflict of interests between banker directors and shareholders of firms with them on boards induces banker directors to lower CEO equity incentives. The conflict of interest seems to be more severe in riskier firms, and the ability of banker directors to influence the CEO's incentive level is stronger when banker directors are part of smaller boards and when they have served on the boards for four years or longer.

5.3. The endogeneity of banker on board

Up to this point, we have treated bankers on boards as exogenous events, although there clearly is evidence suggesting otherwise (Kroszner and Strahan, 2001). Therefore, a natural concern is that our results are driven by our failure to adequately control the endogeneity of bankers on boards, which could bias the coefficient estimates in conventional OLS regressions. We resort to two econometric techniques to correct for the endogeneity bias. The first is the predicted-surprise component decomposition described in Maddala (1983), which Comment and Schwert (1995) use in their study of the deterrence effect of poison pill adoption on hostile takeovers, and the second is the simultaneous-equation system approach also described in Maddala (1983).

5.3.1. Predicted-surprise component decomposition

Kroszner and Strahan (2001) find that commercial bankers are more likely to sit on the boards of large, stable firms with more tangible assets and lower reliance on short-term financing. Following them, we set up a first-stage probit model with the probability of having bankers on boards specified as a function of firm size, stock return volatility (firm risk), asset tangibility ratio, proportion of short-term debt in total debt, and unobservable industry-wide characteristics. The coefficient estimates from the probit model are presented in the 'Probit' column and they are qualitatively similar to those reported by Kroszner and Strahan.

Following Comment and Schwert (1995), we use the probit model's coefficient estimates to compute for each sample firm the predicted probability of banker on board, which proxies for the endogenous component of bankers on boards. The surprise or exogenous component of bankers on boards is then calculated as one minus the predicted probability for firms with bankers on boards or zero minus the predicted probability for firms without bankers on boards. We expect this surprise component to have a significantly negative coefficient when included in the regression if our earlier findings are not driven by endogeneity bias. The two columns under the heading 'C-S (1995)' in table V show that the coefficient of the surprise component is significantly negative, while that of the predicted component is insignificant, which indicates that our results are robust to corrections for endogeneity bias.

5.3.2. System of simultaneous equations

It is also common to address the endogeneity problem in the framework of simultaneous equation system, but the difficult aspect of this methodology is the choice of appropriate instrument variables needed to identify the system. To see this, note that the endogeneity bias is essentially a manifestation of the "omitted variable" problem, which is due to the non-zero correlation between the regressor(s) and the disturbance term. We can get rid of this bias by selecting instrument variables that are uncorrelated with the disturbance term. At the same time, the chosen instruments have to be highly correlated with the problematic or endogenous regressor(s) if we want to reduce the standard error and achieve reasonable statistical significance for the IV estimates. However, here lines the dilemma: "the more correlated the instrument variables are with the problematic regressors, the less defensible the claim that these same variables are un-correlated with the error terms" (Green, 2002, p. 375). Alternatively speaking,

Table 3.5. Results of OLS regressions controlling for the endogeneity of bankers on boards

Tangibility is equal to the book value of property, plant, and equipment to the book value of total assets. *Short-term debt/total debt* is the fraction of short-term debt in the total debt. We construct the *predicted component* and *surprise component* of banker on board using the coefficient estimates in the 'Probit' column. All other variables are as defined in previous tables. Coefficient estimates of the industry dummies are not reported for brevity consideration. Two-sided *p*-values reported in the parentheses are computed based on the White's (1980) heteroskedasticity-consistent standard errors.

Independent variables	Coefficient estimates (p-values)		
	Probit	C-S (1995)	C-S (1995)
Intercept	-3.375 (0.007)	3.692 (0.000)	3.853 (0.000)
Predicted component		-0.762 (0.371)	
Surprise component		-0.228 (0.035)	-0.223 (0.039)
Board size		0.049 (0.049)	0.052 (0.036)
Insider percentage		0.012 (0.018)	0.013 (0.017)
Log (*market equity*)	0.245 (0.002)	-0.189 (0.055)	-0.242 (0.000)
Volatility	8.111 (0.116)	9.537 (0.000)	8.972 (0.000)
Volatility-squared	-15.154 (0.062)	-9.882 (0.008)	-8.674 (0.008)
Tobin's Q		0.142 (0.022)	0.150 (0.015)
Log (*CEO tenure*)		0.506 (0.000)	0.505 (0.000)
Tangibility	0.501 (0.256)		
Short-term debt/total debt	-0.724 (0.042)		
Industry controls	Included	Included	Included
Number of observations	338	338	338
Chi-squared statistic (*p-value*)	33.32 (0.000)		
Adjusted-R^2		43.56%	43.57%

the more theoretically sound the choice of the instrument variables is, the less likely the resultant coefficient estimates are to be significant at conventional levels. Bearing this limitation in mind, we set up our structural model of simultaneous equations as follows:

$$\text{Log}\ (1+\textit{equity incentive}) = \beta_0 + \beta_1\ \textit{BonB} + \beta_2 \log\ (\textit{market value of equity}) + \beta_3\ \textit{volatility} + \beta_4\ \textit{volatility-squared} + \beta_5\ \textit{Tobin's Q} + \beta_6 \log\ (\textit{CEO tenure}) + \beta_7\ \textit{industry controls} + \varepsilon \qquad (*)$$

$$\text{Prob}\ (\textit{BonB}=1) = \Phi\ (\theta_0 + \theta_1 \log(1+ \textit{equity incentive}) + \theta_2\ \textit{margin} + \theta_3\ \textit{margin-squared} + \theta_4 \log(\textit{market value of equity}) + \theta_5\ \textit{volatility} + \theta_6\ \textit{volatility-squared} + \theta_7\ \textit{tangibility} + \theta_8\ \textit{short-term debt/total debt} + \theta_9\ \textit{industry controls} + v) \qquad (**)$$

where Φ is the cumulative standard normal distribution function. The instruments for log(1+*equity incentive*) are *Tobin's Q* and log (*CEO tenure*), neither of which is significantly correlated with *BonB*. The instruments for *BonB* include profit margin (item13/item12), profit margin squared, tangibility, and the percentage of short-term debt in total debt, and none of them is significantly correlated with log (1+*equity incentive*). We select profit margin and its squared term as instruments for *BonB* since an argument can be made that commercial bankers choose to sit on the boards of well-performing firms. We employ a two-stage estimation procedure described in Maddala (1983), which is similar to two-stage least squares (2SLS), but applies specifically to systems in which one equation is a binary choice model.

We present the coefficient estimates of the simultaneous equation system in Table VI. We find that the CEO equity incentives has a positive but insignificant coefficient in equation (**), suggesting that if anything, commercial bankers are more likely to serve as directors of firms whose CEOs have higher equity incentives. The conjecture that bankers choose firms whose CEOs have lower equity incentives is not borne out by the data. In contrast, we find that

Table 3.6. Results of the simultaneous-equation system estimation

The simultaneous equation system is specified by equations (*) and (**). Presented in the table are the coefficient estimates of the structural model with two-sided heteroskedasticity-consistent *p*-values in the parentheses. *Margin* is equal to the ratio of EBITDA (item13) to net sales (item12). All other variables are as defined in previous tables. Coefficient estimates of the industry dummy variables are suppressed for brevity consideration.

Independent variables	Coefficient estimates (p-values)	
	Log (1+*equity incentives*)	BonB
Intercept	1.327 (0.422)	-8.828 (0.000)
BonB	-0.319 (0.025)	
Log (1+*equity incentives*)		0.006 (0.967)
Margin		-3.284 (0.174)
Margin-squared		5.113 (0.290)
Log (*market equity*)	-0.221 (0.003)	0.273 (0.004)
Volatility	12.149 (0.000)	7.207 (0.160)
Volatility-squared	-13.684 (0.002)	-14.285 (0.066)
Tobin's Q	0.159 (0.016)	
Log (*CEO tenure*)	0.551 (0.000)	
Tangibility		0.686 (0.143)
Short-term debt/total debt		-0.667 (0.047)
Industry controls	Included	Included
Number of Observations	338	338

the *BonB* dummy continues to have a significant and negative coefficient in the regression of equity incentives, again supporting our conflict-of-interest hypothesis.

In summary, the evidence in this section shows that the negative effect of bankers on board on CEO equity incentives is not driven by endogeneity bias.

5.4. Alternative explanations and sensitivity tests

To be sure, conflicts of interest is not the only possible explanation for the negative relation between banker on board and CEO equity incentives. In this section, we shall present further evidence and arguments to dismiss four alternative hypotheses: the substitution hypothesis, the interlocking hypothesis, the quasi-insider hypothesis, and the omitted-variable hypothesis. All of our evidence points in the direction of a conflict of interest between shareholders and banker directors and the manifestation of this clash is that banker directors curtail the CEO's equity incentives.

5.4.1. Substitution hypothesis

Just as any other board member, banker directors have the fiduciary duty to serve the best interest of the shareholders by actively monitoring the actions of the CEO and other top executives. Therefore, the negative relation between banker on board and CEO equity incentives can be interpreted as monitoring by banker directors substituting for the CEO's direct equity incentives. However, this hypothesis does not hold in light of the evidence in Table III that the negative impact of banker on board is greater in magnitude at firms with smaller boards. The reasoning is as follows. Since smaller boards are more effective than larger boards in monitoring the managers (Yermack (1996)), the marginal contribution of banker directors as skilled financial monitors should be higher for firms with larger boards. In other words, the monitoring by banker directors is more valuable to firms with larger boards and thus should substitute for more equity incentives at these firms. Therefore, one empirical implication of the substitution hypothesis is that the negative coefficient of *BonB* is larger in magnitude in firms with larger boards. But unfortunately, this is exactly the opposite of what we find.

5.4.2. Interlocking-director hypothesis and quasi-insider hypothesis

Also capable of explaining our results is the conjecture that banker on board may simply proxy for the existence of interlocking directors or gray directors,[49, 50] and that these less independent directors fail to fulfill their duty as agents of the shareholders to design optimal incentive schemes for the CEOs, resulting in lower equity incentives.

To investigate the first possibility, we create a binary variable, denoted by *interlocking*, that is equal to one if a firm has an interlocking director on its board or zero otherwise, and include the dummy as an additional regressor. The results in column (1) of table V indicate that the *interlocking* dummy is not significantly related to the equity incentives, while *BonB* continues to have a negative coefficient, with its magnitude and significance level barely changed by the inclusion of the new variable. As to the second possibility, there is no consensus on whether the gray directors behave more like insiders or outsiders. Therefore, we conduct two experiments that assign the banker directors to either one of the two categories, respectively. Since earlier analyses assume that banker directors are outsiders by default, here we simply reclassify banker directors as insiders and recalculate the insider percentage of the board for firms with bankers on boards. The insider percentage of the board for firms without banker on board stays the same. Column (2) in table VII shows that the coefficient estimate of *BonB* remains negative and becomes larger in magnitude and more significant when we use the new insider percentage measure. Overall the results suggest that it is unlikely that banker on board merely proxies for the existence of interlocking or gray directors.

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[49] An interlocking director on firm ABC's board is defined as a firm ABC's director who is an employee of firm DEF for which a firm ABC's employee serves as a director.
[50] As we mentioned earlier, there often exist business, e.g., lending, relationships between banker firms and banker directors' bank-employers. Therefore, some banker directors quality as gray directors.

Table 3.7. Results from regressions used to reject alternative hypotheses

Interlocking is a binary variable equal to one if there is an interlocking director on a firm's board or zero otherwise. I*nsider percentage-new* is calculated as (number of insider directors + number of banker directors)/total number of directors. *Leverage* is equal to ratio of the book value of total debt to the book value of total assets. All other variables are as defined in previous tables. Coefficient estimates of the industry dummies are not reported for brevity consideration. Two-sided *p*-values reported in the parentheses are computed based on the White's (1980) heteroskedasticity-consistent standard errors.

Independent variables	Coefficient estimates (p-values)			
	Column (1)	Column (2)	Column (3)	Column (4)
Intercept	3.850 (0.000)	3.842 (0.000)	3.769 (0.000)	4.314 (0.000)
BonB	-0.243 (0.027)	-0.371 (0.002)	-0.251 (0.023)	-0.239 (0.031)
Board size	-0.052 (0.037)	-0.049 (0.050)	0.049 (0.055)	-0.045 (0.084)
Insider percentage	0.013 (0.014)		0.013 (0.012)	0.013 (0.016)
Insider percentage-new		0.013 (0.015)		
Interlocking	0.113 (0.518)	0.117 (0.503)	0.112 (0.522)	0.130 (0.443)
Log (*market equity*)	-0.236 (0.000)	-0.239 (0.000)	-0.243 (0.000)	-0.250 (0.000)
Volatility	9.233 (0.000)	9.328 (0.000)	9.680 (0.000)	9.375 (0.000)
Volatility-squared	-9.182 (0.006)	-9.277 (0.005)	-9.657 (0.003)	-9.426 (0.004)
Tobin's Q	0.150 (0.014)	0.151 (0.013)	0.149 (0.014)	0.133 (0.041)
Log (*CEO tenure*)	0.505 (0.000)	0.506 (0.000)	0.511 (0.000)	0.520 (0.000)
Free cash flow			-17.243 (0.000)	-18.108 (0.000)
Tangibility				-0.609 (0.161)
Leverage				-0.144 (0.779)
Short-term debt/total debt				0.029 (0.919)
Industry controls	Included	Included	Included	Included
Number of Observations	339	339	339	338
Adjusted R2	43.59%	43.58%	43.91%	44.02%

5.4.3. The 'omitted-variable' problem

There is always the danger that we leave out of our model some variables that are correlated with both banker on board and equity incentives, and the negative relationship we have established is a spurious one. We may never completely rule out this possibility, but we believe it is unlikely to be the case for three main reasons. First, our list of explanatory variables is a nearly exhaustive one, including all the determinants of CEO equity incentives identified in the literature. Second, despite our small sample size, the goodness of fit of our model is comparable to that in other studies (see, e.g., Core and Guay (1999)) that use several thousand firm-year observations. Third, criticisms of this sort seem to have difficulties dismissing such findings as the magnitude of the impact of banker on board being greater in riskier firms, firms with smaller boards, and firms with long-tenured banker directors.

This all being said, we re-run the regressions of equity incentives with a few more control variables included. Specifically, we add as additional regressors asset tangibility, leverage, and proportion of short-term debt in total debt of a firm and a proxy for a firm's free cash flow problem. *Leverage* is defined as the ratio of the book value of total debt to the book value of total assets. Following Core and Guay (1999), a firm's *free cash flow* is equal to zero if the firm's Tobin's Q is greater than one or equal to the max[0, (operating cash flow - cash dividend - interest payment - tax payment)/total assets] otherwise. A number of papers have examined the effect of leverage and free cash flow on CEO equity incentives, but the evidence is inconclusive. *Tangibility* and *short-term debt/total debt* are considered because they are related to banker on board. The results in columns (3) and (4) show that only *free cash flow* has a significant coefficient. Its negative sign is inconsistent with the hypothesis that to reduce the agency cost, CEO equity incentives are set at higher levels at firms with more free cash flows. One possible explanation is that firms with more free cash flow tend to pay their CEOs in cash rather than in stock and options, resulting in lower equity incentives.

5.4.4. Sensitivity tests

For some of the variables in our regressions, we experiment with several versions. For example, in place of the market value of equity, we use either net sales or the book value of total assets to measure firm size; we substitute market leverage for book leverage; we calculate stock return volatility based on the return residuals from a market model rather than the returns themselves; and we repeat our analyses using the dollar value of equity incentives measure proposed by Core and Guay (1999) and Hall and Liebman (1998). Our results are not sensitive to these variations.

6. Conclusions

We examine the effect of bankers on boards on firms' CEO compensation policy, one of the most important tasks of the board of directors. The reason for our focus on these commercial-banker directors is that we believe a conflict of interest is most likely to occur between them and the shareholders they ought to serve. The underlying origin of the tension is of two folds: (i) the regulatory obstacles prevent commercial banks from holding significant equity stakes in non-financial firms, and (ii) the fact that banker directors' personal wealth and career concerns are mostly tied to the well being of their own banks dictates that if there is a conflict of interest, they will side with their banks at the expense of the shareholders of banker firms. Banker director's incentives may become misaligned with those of the shareholders due to the forces coming from three possible sources: (i) the classical conflict of interest between shareholders and creditors, (ii) the lender liability and equitable subordination provisions in the pro-shareholder U.S. bankruptcy doctrine, and (iii) the concern of banker directors about being associated with financially distressed firms for fear of being punished by the market for corporate directorships. The conflict coming from any of the above three directions may induce banker directors to reduce the use of equity-based compensation and lower CEO equity incentives.

Consistent with the conflict-of-interest hypothesis, we find that banker on board has a significantly negative impact on the level of CEO equity incentives. We also find support for three corollaries of the main hypothesis: the negative effect of banker on board is particularly stronger at (i) riskier firms since the conflict of interest between shareholders and banker directors is more acute in these firms, (ii) firms with smaller boards since it is easier for banker directors to gain a majority voice in smaller groups and the preference of banker directors is more likely to be influential or acquiesced to, and (iii) firms where banker directors have served on the board for four year or longer, since it takes time for banker directors to be able to influence CEO compensation policy and have their influence felt on the board. Importantly, our results are robust to corrections for the potential bias due to the endogeneity of bankers on boards.

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