



Board compensation practices and agency costs of debt

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ABSTRACT

Extant theory and empirical evidence indicate that equity-based compensation can align the interests of *managers* with those of shareholders, but it has a side effect of aggravating bondholder-shareholder conflicts by increasing managers' risk-shifting incentives. Recent evidence confirms that extending equity-based compensation to *outside directors* also is effective in aligning their interests with those of shareholders, but its adverse effects on the debt-related agency problems are unknown. In this paper, we examine how stock and stock option compensation for outside directors affects corporate bond yields in the secondary market. Our results show that the greater the ratio of outside directors' stock and option compensation to total compensation, the lower the average yield spreads on the firms' outstanding bonds, with stock compensation having a larger impact than option compensation. Further, the effect of equity-based compensation on yield spreads is stronger for firms with lower-rated debt.

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1. Introduction

The literature on agency problems, pioneered by Jensen and Meckling (1976), points out that shareholders of leveraged firms have incentives to expropriate wealth from bondholders through investing in riskier projects. Anticipating these incentives, bondholders require higher returns on their capital resulting in higher cost of debt. Further, shareholder–manager conflicts in the form of managerial work-shirking, perquisite consumption, and overinvestment emerge when managers own but a fraction of the firm. Since shareholders stand to bear the aggregate agency costs, they have an incentive to seek optimal investment and financing policies. A fundamental solution to these conflicts (other than equity-based compensation for managers) is to create a board of directors to monitor managers on behalf of stockholders. However, like managers even directors may lack incentives to act in the best interest of shareholders. To reduce the *director–shareholder conflicts*, a growing number of firms have awarded equity-based compensation to outside directors over the last decade.¹ Recent evidence suggests that equity-based compensation helps align incentives of outside directors and shareholders (Fich and Shivdasani, 2005; Bryan et al., 2000).

However, there exists little evidence on the effects of equity-based compensation for directors on the *director–bondholder* conflicts. In this empirical paper, we examine two major hypotheses about the impact of the structure of outside director compensation on the agency costs of debt. Specifically, our *monitoring hypothesis* posits that equity-based compensation for directors would improve board oversight and reduce corporate bond yield spreads. Effective monitoring will help decrease agency problems such as managerial shirking, perquisite consumption, and overinvestment and benefit all stakeholders including bondholders. On the flip side, equity-based compensation schemes (that increase the convexity of payoffs to directors) could

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¹ For example, Perry (1999) finds the percentage of S&P 500, Midcap and Smallcap index firms that use equity-based compensation for outside directors increased from 48% to 70% from 1992 to 1995.

motivate outside directors to favor more risky investment opportunities and financial policy alternatives put forward by managers, or even encourage them to pursue such policies. We term such an incentive pay-induced preference for risky policies as the *risk-shifting hypothesis*. If these risk-shifting incentive effects dominate, we will observe a positive relation between equity-based compensation and yield spreads. Overall, if monitoring (risk-shifting) incentive effects dominate, we will observe a negative (positive) association between stock and option compensation and yield spreads. Thus the net effect of incentive compensation for outside directors on yield spreads is an empirical question.

In addition, we investigate two sub-hypotheses related to our two major hypotheses. The first of these is related to the differential risk-shifting incentive effects of stocks and stock options, while the second is related to the quality of outstanding debt. Examining the effects of CEO compensation, Guay (1999) notes that stock options provide stronger risk-taking incentives than do stock holdings. This motivates our *form of compensation hypothesis* which claims that bondholders would demand higher yield spreads from firms that offer *option compensation* rather than *stock compensation* to outside directors. Second, the monitoring role of corporate governance mechanisms might be more important for firms that issue poor quality debt than otherwise (Bhojraj and Sengupta, 2003). For firms with high default risk, traditional measures of past profitability of the firm might not be very informative about future cash flows, prompting lenders and rating agencies to rely more on the compensation structure of outside directors (in addition to that of managers). This leads us to predict that investors in poorly-rated debt view equity-based compensation for outside directors, especially stock grants, more favorably due to its monitoring incentive effects than their counterparts holding high-quality debt. We term this prediction the *default risk hypothesis*.

Our main findings are as follows. First, we find that the percentage of stock and option compensation to total compensation of outside directors is negatively associated with seasoned bond yield spreads after controlling for standard spread determinants. This suggests that the monitoring incentives induced by equity-based compensation for outside directors exceed the risk-shifting incentives. Second, we find that stock compensation for outside directors is associated with a larger decrease in yield spreads in comparison to option compensation. This result suggests that monitoring incentives provided by stock compensation are stronger than those provided by option compensation since options are more likely to induce risk-taking incentives. Finally, our results show that the impact of equity-based compensation for outside directors on yield spreads is stronger when the quality (as measured by default ratings) of outstanding debt is low. These results are robust to tests of endogeneity of director compensation and sample selection and lend further credence to our claim that the negative relationship we uncover is not the result of omitted/unobservable firm or board characteristics that happen to be correlated with director compensation. In sum, we find that the *monitoring* and *risk-shifting* effects of incentive compensation for outside directors on yield spreads depend upon both the instruments of director compensation (i.e., compensation form) and the quality of firms' outstanding debt.

The results presented in this paper are economically significant. The regression estimates indicate that the mean yield spread on outstanding bonds drops by 1.6 basis points for a marginal 1% increase in the ratio of director stock and option compensation to total compensation. When we separate the stock and option compensation components, the mean yield spread decreases by 1.5 basis points for a 1% increase in the ratio of stock compensation to total compensation. In our sample, the median firm with a ratio of stock compensation to total compensation equal to 8% pays approximately 12 basis points less on its public debt than firms that do not offer stock compensation to their directors.²

This paper contributes to the existing literature in several ways. First, we provide a comprehensive analysis of the impact of director incentives on the cost of debt. Such an analysis is important since there has been a substantial increase in director equity-based compensation (see, e.g., Perry, 1999) in US corporations and a significant increase in regulatory scrutiny over corporate compensation policies for directors and managers in recent years. Further, as debt constitutes a considerable part of firms' capital structure in the US, it is important to understand the factors that affect the cost of debt to a firm.³ Second, we distinguish between the monitoring and risk-shifting effects of incentive schemes and find that both effects drive the relation between yield spreads and outside director compensation as evidenced by the differential effects of stock and option compensation. Finally, we show that the monitoring benefits of directors' equity-based compensation are especially important for companies with higher credit risk (i.e., lower-rated bonds).

Our results are consistent with the findings of Fich and Shivasani (2005) and extend the results of Bhojraj and Sengupta (2003) and Anderson et al. (2004). Our main finding that equity-based compensation is linked to lower yield spreads is in line with Fich and Shivasani (2005) who report that firms with outside director stock option compensation plans have significantly higher market to book ratios and profitability metrics. Anderson et al. (2004) and Bhojraj and Sengupta (2003) provide evidence that board independence is associated with lower debt costs consistent with the argument that bondholders favor monitoring mechanisms that are likely to restrict managerial opportunism. Anderson et al. (2004) also examine whether *director ownership* is linked to the cost of debt but could not find any significant relation between director ownership and yield spreads. We extend their analysis to examine the impact of directors' stock and option compensation as well as ownership on the cost of debt. However, our results on director pay are at variance with those of Ortiz-Molina (2006) who finds that at-issue yield spreads are *positively* related to *top management* stock and stock option holdings, suggesting that managerial *equity ownership* aggravates risk-shifting

² The economic significance of the results of this paper is comparable to similar studies. Ortiz-Molina (2006) reports that borrowing costs are 8 basis points higher at a firm with top management ownership in the 75th percentile than in a firm with top management ownership in the 25th percentile. Anderson et al. (2003) find that cost of debt financing for family firms is about 32 basis points lower than it is in non-family firms. Klock et al. (2005) document that the firms with strongest antitakeover provisions (firms with higher values of Gompers et al. (2003) shareholder rights index) pay about 34 basis points less in borrowing costs than the firms with weakest governance provisions.

³ According to the Board of Governors of the Federal Reserve System Flow of Funds publications, the ratio of total debt to market value of equity for U.S. non-farm, non-financial firms for the year 2002 was 62.7%. The total amount of credit market instruments was \$4899.3 billion.

incentives. It is worth emphasizing that none of the above studies offer a comprehensive analysis of the effects of outside director incentive compensation on the cost of debt.

The remainder of the paper is organized as follows. The following section reviews the literature and presents our hypotheses. Section 3 describes the data and the research method. Section 4 reports and discusses the results of multivariate analyses. Section 5 presents robustness checks. Section 6 concludes.

2. Related literature and hypotheses

In this section we review the literature on the monitoring and risk-shifting incentives of pay-for-performance for managers and directors. Then we develop our hypotheses regarding the effects of incentive compensation for outside directors on the agency cost of debt.

2.1. Monitoring and risk shifting

Several recent studies have examined the relation between ownership structure, corporate governance and bondholder–stockholder conflicts. Bhojraj and Sengupta (2003) find a positive (negative) relation between institutional ownership and the percentage of outside directors and bond ratings (yields). Anderson et al. (2004) report that firms with larger boards and higher percentage of independent directors have lower cost of debt, but they do not find any significant evidence for director stock ownership. While Klock et al. (2005) suggest that antitakeover provisions are favored by bondholders but not by shareholders, Cremers et al. (2007) point out that the presence of a strong shareholder is associated with lower (higher) bond yields if the firm is protected by strong (weak) takeover defenses. Investigating the effects of governance mechanisms on bond ratings, Ashbaugh-Skaife et al. (2006) find that bond ratings are negatively associated with the number of blockholders that hold at least a 5% ownership in the firm and positively related to overall board independence, board stock ownership, and board expertise.⁴ When directors of independent boards receive stocks and stock options, Perry (1999) finds an increase in the likelihood of CEO turnover following poor performance, indicating that equity-based compensation increases the monitoring incentives of outside directors.

As delegated monitors, outside directors are charged with the responsibility of providing effective oversight over managers such that conflicts of interest between stockholders, bondholders and managers are minimized. However, when they are compensated in the form of annual director retainers and fees paid for attending regular and special board meetings, their pay is remotely tied to firm performance. In contrast, equity-based compensation ties outside director compensation more closely to the value of equity. By increasing the pay-performance sensitivity, incentive compensation can provide strong incentives to outside directors to monitor management. Bondholders can benefit from effective monitoring by outside directors through a reduction in agency problems such as shirking, perquisite consumption, and overinvestment. Moreover, the relatively undiversified stakes of directors and managers tends to induce them to pass up risky, positive NPV projects. By offering incentive compensation with convex payoffs, shareholders can reduce these risk-related agency costs and mitigate the underinvestment problem (Guay, 1999).⁵ Consistent with these arguments, we expect that both stock and option compensation schemes for outside directors would strengthen board monitoring of corporate managers, mitigate managerial opportunism and mismanagement and thus lower the cost of debt capital.⁶ We call this the *monitoring hypothesis*.

Turning to risk-shifting incentives, John and John (1993) develop a model in which optimal managerial compensation depends not only on the agency relationship between shareholders and management but also on the conflicts of interest that arise in other contracting relationships. They argue that a compensation structure that aligns the interests of shareholders with management would increase the risk-shifting incentives of managers. Their model implies a *positive* relation between bond yield risk premium and managerial holdings of stocks and stock options. In support of these predictions, Ortiz-Molina (2006) finds a *positive* relation between managerial ownership and at-issue yield spreads. Moreover, he finds that the effect of managerial *option ownership* on yield spreads is larger than the effect of managerial *stock ownership* on yield spreads. Bryan et al. (2006) find that the ratio of managerial option compensation to total compensation is higher for firms that face less likelihood of asset substitution problems. While Morgan and Poulsen (2001) present weak evidence of positive stock market reaction to the announcement of proposals for performance-based pay plans for directors, DeFusco et al. (1990) document a negative bond market reaction to the announcement of executive stock option plans. Bryan and Klein (2004) report that director option compensation is positively related to future change in R&D expenditures and stock volatility. Billett et al. (2006) observe a positive (negative) stock (bond) market reaction to the first-time equity grants to CEOs. Analyzing the impact of CEO stock and option ownership on outstanding debt yields, Anderson et al. (2006) find that yield spreads are increasing in the CEO option ownership but decreasing in stock ownership. Further, Coles et al. (2006) find that CEOs implement riskier policy choices including relatively more investment in research and development and less investment in property, plant and

⁴ Ashbaugh-Skaife et al. (2006) find that the number of directors who own stock in the firm is positively related to bond ratings using 2002 data. They do not examine the impact of the level of director ownership on ratings, nor that of option compensation for outside directors. Moreover, since they use bond rating rather than yield as the dependent variable, it is harder to quantify the economic impact of director incentives on the cost of debt from their analysis.

⁵ Guay (1999) hypothesizes that equity holders in growth firms can reduce the expected loss from valuable (+NPV) but risk-increasing projects bypassed by managers by offering them incentive schemes that have convex payoffs. Consistent with this hypothesis, he finds that the convexity in the relation between CEOs' wealth and stock price is positively related to the investment opportunity as proxied by book-to-market ratio of assets, R&D expenses divided by the market value of assets and investment expenditures plus acquisitions as a ratio of market value of assets.

⁶ Reeb et al. (2001) make a similar argument related to the effect of monitoring on the cost of debt in the context of firm internationalization. They argue that the degree of firm internationalization might be associated with higher yield spreads due to greater agency costs resulting from monitoring difficulties.

equipment when the sensitivity of their wealth to stock price volatility is high. In contrast, Lewellen (2006) observes that options tend to dampen managerial risk incentives when managers are risk averse and ill-diversified.

Drawing from John and John (1993), we conjecture that equity-based compensation for outside directors would tempt outside directors to favor more risky investment and financial policy alternatives put forward by managers, or even encourage them to pursue such policies, thus increasing their risk-shifting incentives. If these risk-shifting incentive effects dominate, we would observe a positive relation between equity-based compensation for outside directors and debt-related agency costs. We call the potential positive association between equity-based compensation for outside directors and the agency cost of debt the *risk-shifting hypothesis*.

It is difficult to predict whether the beneficial effects of monitoring on the agency cost of debt outweigh the risk-shifting incentives of equity-based compensation for outside directors. The literature review offers fragmented and often mixed evidence on the impact of board effectiveness and managerial pay plans on borrowing costs. But Fich and Shivdasani (2005) report that firms with outside director stock option compensation plans have significantly higher market to book ratios, suggesting that both stockholders and bondholders stand to benefit. Our goal is to provide more comprehensive and direct evidence on the link between the agency cost of debt and stock and option compensation for outside directors.

2.2. Form of compensation

In broad terms, compensation packages for managers and directors include cash, stocks and stock options. From the literature on options we know that stocks are call options on the assets of a leveraged firm, and call options on those stocks contain even greater degrees of leverage. Agency theory tells us that the extent of financial leverage in the corporate capital structure (i.e., the debt-equity mix) has significant managerial incentive effects. Specifically, financial distress exacerbates managerial risk-shifting behavior when firms are highly leveraged. In a similar vein, it is important to note the differences in the leverage composition of compensation packages in understanding their incentive effects. While cash compensation has no leverage component, stock compensation entails hidden leverage derived from the extent of debt employed by the firm. Compensation in the form of stock (call) options contains even more leverage than stock compensation.

Similar to corporate leverage, we expect 'leveraged compensation' to magnify the risk-seeking incentives of executives and directors. This argument is consistent with the findings of Guay (1999) that stock options provide more risk-taking incentives than stock holdings. Therefore, we expect the relation between the agency cost of debt and stock option-based pay to be different from the relation between the agency cost of debt and stock compensation. To the extent that stock compensation increases monitoring incentives of outside directors more than it increases the risk-shifting incentives, we expect debtholders to favor stock compensation for outside directors. In contrast, since risk-shifting incentives induced by options are stronger, we expect that the option compensation would increase the agency costs. In other words, if the risk-shifting incentives induced by stock options exceed the monitoring incentives, we expect the agency cost of debt to be higher for firms that offer higher levels of option compensation to outside directors. We call this prediction the *form of compensation hypothesis*.

2.3. Default risk and director equity-based compensation

Bhojraj and Sengupta (2003) argue that the monitoring role of corporate governance mechanisms might be more important for firms that issue poor quality debt than otherwise. In the same spirit, for firms with high default risk traditional measures of past profitability and leverage might not be very informative about future cash flows, prompting lenders and rating agencies to rely more on the compensation structure of outside directors of the firm. Therefore, if the monitoring incentives dominate, we expect that investors in poorly-rated debt view equity-based compensation for outside directors, especially stock grants, more favorably than their counterparts holding high-quality debt. However, if the risk-shifting incentives dominate, then we would see the yield spreads widen for poorly-rated firms. The latter is likely because conflicts of interest between lenders and owners tend to be aggravated with rising default risk and potential financial distress. We term this prediction the *default risk hypothesis*.

3. Data and research method

3.1. Data

We manually collect bond data from Mergent Bond Record, which provides monthly data on corporate bond yields, issue dates and amounts and Moody's ratings.⁷ The source of director compensation data is Execucomp, which provides information on annual cash retainers paid to each director, fees paid to directors for attending board meetings and number of meetings in a year, number of options received by each non-employee director and number of shares of stock (including restricted stock) that were granted to each non-employee director during the year. Board composition data are from The Corporate Library Board Analyst Database and from proxy statements. We start with all the companies in Execucomp database with director compensation data for the years 2000, 2001, and 2002. Excluding financials and utilities leaves us with 4010 firm-year observations.⁸ Among 4010 firm-year

⁷ Mergent Bond Record was formerly called Moody's Monthly Bond Record. Klock et al. (2005) use the same data source for debt yields for 2002.

⁸ Excluding financials and utilities from the data is a common practice in studies examining bond yields and corporate governance. Ortiz-Molina (2006) and Cremers et al. (2007) also exclude financial firms and utilities. Anderson et al. (2003, 2004), Bhojraj and Sengupta (2003), and Klock et al. (2005) use only industrial firms in their analyses. We exclude financials and utilities to maintain comparability with other studies.

observations, yield to maturity data on outstanding corporate bonds is available from Mergent Bond Record for 1035 firm-year observations. The availability of the board of directors data (board independence, board size, director tenure, percentage of institutional investors on the board, etc.) reduces our dataset to 783 firm-years. Thus, our dataset consists of 783 firm-year observations for 360 different firms covering 40 different Fama and French (1997) industries with annual bond and compensation data available for the years 2000, 2001, and 2002.⁹

3.2. Research method

3.2.1. Measuring agency cost of debt

Previous studies (McDaniel, 1986; Anderson et al., 2003) suggest that bond covenants rarely succeed in completely eliminating stockholder–bondholder conflicts, and bondholders will demand a premium for bearing the agency cost. This implies that the residual bond yield to maturity (after controlling for other determinants such as duration, rating, liquidity, and issuer characteristics) will impound a premium for the cost of debt arising from agency costs. Following Duffee (1998) and Anderson et al. (2003), we measure the cost of seasoned (outstanding) debt by the yield spread, which is the difference between the weighted average yield on the firm's outstanding year-end debt obligations (excluding convertible bonds and floating rate bonds) and the yield on a constant maturity Treasury security with similar duration (published by Federal Reserve Bank of New York).

3.2.2. Compensation and ownership variables

We use measures of stock and option compensation for outside directors and their ownership as test variables, while controlling for the structure of compensation and ownership of managers. All our measures of compensation are annual. The ratio of equity-based compensation to total compensation for directors (*Dir. Stock and Option Compensation*) is computed as the value of stock grants plus the Black–Scholes value of options, divided by total compensation. Total compensation is equal to the sum of director meeting fees multiplied by number of meetings, annual cash retainer, value of stocks, and Black–Scholes value of option grants. To compute the Black–Scholes value of option grants, we need information about the exercise price and time to expiration. Following Yermack (2004), we assume that exercise price is equal to the average stock price during the grant year and time to maturity is 10 years. We use standard deviation of stock prices over 60 months (BS_VOLATILITY in Execucomp) and the company's average dividend yield for 3 years (BS_YIELD in Execucomp) in our computations. The risk free rate is set equal to the 10-year constant maturity Treasury bond yield as of year end. Due to these assumptions, the Black–Scholes value of options for directors is subject to error. These measures are supplemented by the percentage of total compensation granted in the form of stocks (*Dir. Stock Compensation*) and options (*Dir. Option Compensation*). We also calculate the percentage of stock ownership by outside directors (*Dir. Stock Ownership*), but we do not have data on director option ownership. The definitions of these and other variables are presented in Appendix A.¹⁰

Applying the same procedures, we construct the following variables to control for the percentage of equity-based compensation and equity ownership for top five executives from proxy statements: *Mng. Stock and Option Compensation*, *Mng. Stock Compensation*, *Mng. Option Compensation* and *Mng. Stock Ownership*.¹¹ To calculate option ownership, we divide the sum of the number of options granted that year and the number of options unexercised at the end of the year by the number of shares outstanding (*Mng. Option Ownership*). We add the last two to create a measure of stock and option ownership (*Mng. Stock and Option Ownership*).

Following Core and Guay (2002) and Coles et al. (2006), we also include the following sensitivity variables. *Dir. Sensitivity to Price* represents the change in director's compensation for one percentage point change in stock price.¹² *Dir. Sensitivity to Volatility* denotes the change in director's wealth for a 0.01 change in the annualized standard deviation of stock returns.¹³ Similarly, we calculate the sensitivities of top executives' wealth to stock price (*Mng. Sensitivity to Price*) and volatility (*Mng. Sensitivity to Volatility*).

3.2.3. Issue and firm characteristics

Following Reeb et al. (2001), Anderson et al. (2003), and Ortiz-Molina (2006), we control for issue characteristics as well as firm characteristics in our multivariate regressions. Our controls for bond issue characteristics cover bond duration (measured in years),

⁹ Loss of observations of this magnitude is not uncommon in bond yield studies, see Anderson et al. (2003, 2004) who use a sample of 252 firms. Further, since our analysis includes only firms with outstanding, public debt, we also run a Heckman selection model where the selection equation is whether the firm is in our sample or not. Our main results remain qualitatively the same.

¹⁰ Directors can be outside or inside directors. In our dataset, 94% of the inside directors are among top five executives and their compensation is included in managerial compensation variables.

¹¹ We use the Black–Scholes value of the options provided by Execucomp, which defines volatility as the standard deviation of stock price for 60 months (BS_VOLATILITY) and dividend yield as the company's average dividend yield for three years (BS_YIELD). These options values contain measurement error as they do not incorporate unique characteristics of incentive stock options (i.e., stock options are not traded, are subject to vesting requirements, and directors and managers have limited ability to hedge their wealth).

¹² Overall director wealth can also be affected by events that ruin the reputation of a director such as a corporate scandal due to ineffective monitoring. Loss of reputation can result in loss of directorships which might significantly affect the wealth of the director. However, it is very difficult to construct a measure of director wealth including director reputation. We control for average number of directorships held by outside directors in our determinants of compensation regressions. In untabulated results, the number of directorships was not significantly correlated with yield spreads.

¹³ Since we do not have data on director's option holdings, we could only calculate the delta and vega of the options granted during the year. Therefore, *Dir. Sensitivity to Price* and *Dir. Sensitivity to Volatility* estimate the sensitivities of director's pay to change in stock price and volatility with error. In contrast, *Mng. Sensitivity to Price* and *Mng. Sensitivity to Volatility* account for cumulative stock and option holdings of managers and hence are more reliable measures of sensitivities of managerial wealth.

Table 1
Summary statistics

Variable	Min	Mean	Median	Max	Standard deviation
Yield spread (%)	0.81	3.58	3.15	12.74	2.00
Dir. stock and option compensation (%)	0.00	58.47	60.09	100.00	26.46
Dir. stock compensation (%)	0.00	18.17	7.97	90.67	22.87
Dir. option compensation (%)	0.00	40.25	39.74	100.00	31.81
Dir. stock ownership (%)	0.00	0.94	0.11	27.08	3.53
Dir. stock compensation (\$000)	0.00	22.26	8.42	714.89	43.40
Dir. option compensation (\$000)	0.00	98.29	32.34	3,713.99	253.20
Dir. sensitivity to price (\$000)	1.10	696.51	42.98	23,824.83	3,157.38
Dir. sensitivity to volatility (\$000)	0.00	8.00	3.98	74.60	12.28
Mng. stock and option compensation (%)	0.00	53.23	54.36	96.93	21.84
Mng. stock compensation (%)	0.00	7.99	0.00	62.26	13.40
Mng. option compensation (%)	0.00	45.20	44.04	93.51	21.81
Mng. stock ownership (%)	0.00	2.71	0.50	37.33	6.10
Mng. option ownership (%)	0.10	4.07	2.82	23.31	4.14
Mng. stock and option ownership (%)	0.25	6.83	3.70	49.67	8.42
Mng. sensitivity to price (\$000)	1.12	2,381.20	852.27	48,241.62	5,635.96
Mng. sensitivity to volatility (\$000)	0.00	686.41	360.20	5,860.69	920.46
Board independence	0.11	0.69	0.71	1.00	0.17
G-Index	3.00	10.09	10.00	16.00	2.58
Board size	5.00	10.51	10.00	20.00	2.39
Director tenure	0.00	8.68	8.20	24.17	3.52

This table presents summary statistics for yield spreads, ownership, compensation, and governance variables. Our sample consists of 783 firm-year observations drawn from years 2000–2002. All variables are defined in Appendix A.

credit ratings, and bond liquidity. Duration controls for differences in maturity and coupon rates, and credit ratings proxy for default risk. A potential problem with using bond ratings as an independent variable is that the effect of outside director equity-based compensation may have already been incorporated in the ratings. Recent evidence by [Bhojraj and Sengupta \(2003\)](#) and [Ashbaugh-Skaife et al. \(2006\)](#) suggests that bond ratings are affected by corporate governance mechanisms. Moreover, Standard and Poor's and Moody's report that they incorporate the strength of governance mechanisms into their ratings. To purge out the effects of compensation, ownership, and governance mechanisms, we regress bond ratings on compensation and ownership variables for both managers and directors and the governance variables, and use the error term from this regression as an independent variable in our tests. We measure bond liquidity as the length of time that the bond has been outstanding (bond age). Past research has documented that bond prices reflect liquidity premium and more recently issued bonds are more liquid than previously issued bonds ([Green and Odgaard, 1997](#)).

We also control for firm characteristics in our multivariate regressions. Larger firms are considered safer investments, since they tend to have more diversified assets and larger asset bases. We measure firm size as the log of total assets. To control for credit risk, we use leverage ratio defined as long-term debt divided by total assets. Since more profitable, better performing firms are less likely to default, they will be characterized by lower yields. We measure profitability as operating income scaled by total assets (ROA) and firm performance with sales growth. To control for the risk of the firm, we use the standard deviation of ROA for the past 5 years. Since high growth firms have more risk-shifting incentives, we use Tobin's Q to control for the firm's growth opportunities.

As [Bhojraj and Sengupta \(2003\)](#) find a negative relation between institutional ownership and the presence of outside directors and bond yields, we also include institutional ownership and percentage of independent directors as control variables in our regressions. Consistent with [Klock et al. \(2005\)](#), we use [Gompers et al. \(2003\)](#) Index (G-Index) to control for shareholder rights. Following [Anderson et al. \(2004\)](#), we include board size and director tenure to account for board characteristics in our regressions. It is possible that outside directors who are affiliated with financial institutions might have different influence on the cost of debt. To explore this possibility, we identify institutional investors, venture capitalists, and investment bankers in our list of directors by matching the names of the companies that they work for to a list of institutional investors from 13F filings and to a list of venture capital and investment banks from SDC. We include the percentage of institutional investors, venture capitalists, and investment bankers serving on the board as control variables in our regressions. Finally, we include year dummies and [Fama–French \(1997\)](#) industry dummies to control for industry differences.¹⁴

3.2.4. Summary statistics

[Table 1](#) presents descriptive statistics for yield spreads, compensation, ownership, and governance variables.¹⁵ For our sample of 783 firm-years, the average and median yield spreads are around 3.58% and 3.15%. On average, equity-based compensation

¹⁴ Director and managerial compensation and ownership vary gradually over time. In our sample, the average annual change in the percentage of director stock and option compensation is only 1%. In such a setting, including fixed firm effects would be problematic as it would remove all cross-sectional variation, although we would expect a cross-sectional relation between director compensation and yield spreads. See [Zhou \(2001\)](#) for further discussion on the use of fixed firm effects in [Himmelberg et al. \(1999\)](#) and in other studies.

¹⁵ To reduce the effect of outliers, yield spreads and compensation variables were winsorized at 1% and 99%.

constitutes 58% of total compensation for directors. Option compensation is a much greater percentage of total compensation than stock compensation on average (40% vs. 18%). In our sample, the mean percentage of stock and stock option compensation for external directors is higher than that for managers, which is 53%. Also, managers own 3% of the firm's equity on average, as compared with a mean of 0.9% for outside directors. If we include stock options, their mean equity stake goes up to 7%. The sensitivity of outside directors' wealth to one percent change in stock price is \$43,000 at the median. Sensitivity to volatility is much smaller at around \$4000. For managers these numbers are much higher. Sensitivity of top managements' wealth to stock price is \$852,000 and sensitivity to stock price volatility is \$360,000 at the median. As for the board structure and governance variables, average percentage of independent directors 69% and the [Gompers et al. \(2003\)](#) shareholder rights index is 10 on average. In our sample, average board size is 10.5 and average director tenure is 8.7 years.

To get a first look at the link between the agency cost of debt and board and executive compensation in our sample, we present in [Table 2](#) pairwise correlations of director and manager compensation and manager ownership variables with yield spreads as well as with other variables. The results suggest that equity-based compensation for directors is negatively associated with yield spreads (–23%). Yield spreads are negatively correlated with the percentage of director stock compensation at 16%. Percentage of option compensation is also negatively correlated with yield spreads but the correlation is smaller in absolute value at 8%. As expected, these two forms of equity-based compensation are highly negatively correlated, –58%. The sensitivity variables for external directors are negatively correlated with yield spreads similar to compensation variables. As for managerial ownership and compensation variables, we see that the yield spreads are higher for companies with higher levels of option and stock ownership by their managers. The sensitivity variables for managers are also negatively correlated with yield spreads. We also observe that managerial equity-based compensation is positively correlated with director equity-based compensation at 25%.

4. Multivariate analysis

Many believe that director compensation is endogenous and firms choose the method of outside director compensation in light of their need for external monitoring to maximize firm value. Accordingly, we begin with an exploration of the determinants of director compensation and follow it up with tests of our main hypotheses. In the next section, we revisit the issue of endogeneity to scrutinize the robustness of our main findings.

4.1. Determinants of outside director equity-based compensation

We examine the determinants of director compensation using the Tobit regression specification below:

$$\begin{aligned} \text{Director compensation}_{it} = & a_0 + a_1 \text{Leverage}_{it} + a_2 Q_{it} + a_3 \text{R\&D sales}_{it} + a_4 \text{Dir. stock ownership}_{it} + a_5 \text{Manager compensation}_{it} \\ & + a_6 \text{Manager ownership}_{it} + a_7 \text{NOL dummy}_{it} + a_8 \text{Cash flow}_{it} + a_9 \text{Cash level}_{it} \\ & + a_{10} \text{EPS positive dummy}_{it} + a_{11} \text{EPS exceed dummy}_{it} + a_{12} \text{OI dummy}_{it} + a_{13} \text{Sales growth}_{it} \quad (1) \\ & + a_{14} \text{Board independence}_{it} + a_{15} \text{Institutional ownership}_{it} + a_{16} \text{Number of directorships}_{it} \\ & + a_{17} \text{Size}_{it} + a_{18} \text{Industry dummies}_{it} + a_{19} \text{Year dummies}_{it} + \varepsilon_{it} \end{aligned}$$

In the above specification, *Director compensation* represents *Dir. Stock Compensation* and *Dir. Option Compensation*, while *Manager compensation* denotes *Mng. Stock Compensation* and *Mng. Option Compensation*, and *Manager ownership* refers to *Mng. Stock Ownership* and *Mng. Option Ownership*. We also repeat the same specifications with the logs of the two director wealth sensitivity as dependent variables.

The literature on conflicts of interest predicts that the agency cost of debt increases with the degree of leverage. If incentive plans align the interests of outside directors more effectively with those of the shareholders relative to bondholders, equity-based compensation plans, especially stock options, can increase debt-related agency problems. Therefore, firms with high leverage might prefer to give lower amounts of options to their outside directors ([Bryan and Klein, 2004](#)). Further, if debt plays a disciplinary role by reducing overinvestment, firms would need less of the monitoring benefits provided by equity-based compensation. Both of these arguments suggest a negative relation between leverage and director equity-based compensation. However, we find from [Table 3](#) that leverage is not significantly related to director compensation.¹⁶

[Bryan et al. \(2000\)](#) and [Bryan and Klein \(2004\)](#) argue that firms with rich investment opportunities are more likely to rely on equity-based compensation. Stock grants, because of their relatively linear payoff structure, may contribute to the under-investment problem due to managerial risk aversion. In contrast, option grants are more likely to induce managerial risk-taking which is important for high investment opportunity firms. It might also be argued that R&D-intensive firms are costlier to monitor and therefore might grant more stocks and options to their directors. We use market-to-book ratio (Q) and R&D over sales as proxies for investment opportunities. Following [Yermack \(2004\)](#), we set the missing observations for R&D expenditures to zero. The estimates in [Table 3](#) provide fairly strong support for these arguments.

Since firms with higher managerial ownership might need less monitoring mechanisms, we expect the fraction of director equity-based compensation to be lower for such firms. The same argument might also hold for equity-based compensation for managers. On the other hand, firms that offer equity-based compensation to their top management might be more likely to extend

¹⁶ The results based on OLS regressions are qualitatively similar to the Tobit results, except for differences in the significance levels of some variables.

incentive compensation to their directors, implying a positive relation between managerial equity-based compensation and director equity-based compensation. Accordingly, we include *Mng. Stock Compensation*, *Mng. Option Compensation*, *Mng. Stock Ownership*, *Mng. Option Ownership* as well as the number of shares owned by outside directors (*Dir. Stock Ownership*) in our regressions. Further, we include *Dir. Option Compensation* (*Dir. Stock Compensation*) as an independent variable in the regressions where *Dir. Stock Compensation* (*Dir. Option Compensation*) is the dependent variable.

The Tobit regression estimates show a negative association between managerial stock ownership and stock compensation for directors, suggesting that when managers' incentives are aligned with shareholders, there is less need for the monitoring incentives provided by equity-based compensation for directors. On the contrary, we find that the option ownership of managers is positively associated with director stock compensation, suggesting that monitoring by directors is more important when managers own more options. Similar to the findings of Bryan and Klein (2004), the results show a strong negative relation between director option compensation and director stock compensation, suggesting that they might be substitutes.

Yermack (2004) argues that option compensation, and to a certain extent restricted stock compensation, may provide tax advantages. To test for the role of tax benefits, we use an indicator variable, *NOL dummy*, that takes the value of one if the company has net operating loss carry-forward in its balance sheet, and zero otherwise. We do not find support for this argument. Further, Bryan et al. (2000) argue that firms with low levels of cash are more likely to compensate outside directors with equity-based compensation rather than cash compensation. On the other hand, firms with high levels of cash are more likely to have equity-related agency costs, and therefore might need more of the monitoring benefits provided by equity-based compensation (Jensen, 1986). We use free cash flow (measured as operating income before depreciation less the sum of income tax, interest, and dividends scaled by book value of assets) and cash level (cash and cash equivalents divided by book value of assets) as measures of liquidity. Our results show that cash level is positively related to director option compensation, implying that the cash flow-related agency concerns are dominant.

Unlike stock grants, option awards were not expensed and would not have reduced the firms' reported net income in our sample period. Therefore, firms with higher financial reporting costs (i.e., firms which would have reported negative or less than last year's earnings per share if options granted to employees had been expensed) might be more likely to award options to their outside directors. We follow Brown and Lee (2007) to construct the following two proxies for financial reporting costs. *EPS positive dummy* is a dummy variable that takes the value of one if the firm would have reported negative earnings if employee stock options had been expensed, and zero otherwise. *EPS exceed dummy* is a dummy variable that takes the value of one if the firm would not have met or exceeded last year's earnings per share if employee stock options had been expensed, and zero otherwise. We explain the details of the construction of these variables in Appendix A. We also add *OI dummy*, a dummy variable that takes the value of one if the company has negative operating income before depreciation, and zero otherwise, to examine whether firms with poor earnings prefer option compensation for their directors because of its income non-dilutive effects.

We find little support for the income non-dilutive motive for extending stock options to outside directors. The coefficients of *EPS positive*, *EPS exceed*, and *OI dummy* are generally not significantly different from zero in specifications for option compensation. One reason that the accounting treatment of options does not have an influence on option compensation for directors might be that the values of the options granted to directors are much smaller than those granted to managers. In our sample, the median dollar value of option compensation granted to outside directors in a year is about \$225,000, while this number is \$6.2 million for top five managers.

Moreover, one can argue that firms that offer stock compensation to directors as opposed to option compensation signal that they might be better firms since they can afford the decrease in net income due to the expensing of stock awards. To examine whether better quality firms offer stock compensation to its directors, we include sales growth in our regressions in addition to Q, cash flow, and cash level. We find little evidence to suggest that better performing firms prefer granting stock compensation to directors rather than option compensation. Sales growth is not significantly related to option compensation and negatively related to stock compensation contrary to expectations. Further, cash level is positively related to option compensation and book-to-market ratio is positively related to both stock and option compensation.

Turning to governance variables, Bryan and Klein (2004) argue that independent directors provide more effective monitoring, which could reduce the need for equity-based compensation for directors. Institutional investors have fewer free rider problems and strong incentives to monitor the management. However, institutional shareholders, who might trade on short-term earnings, can cause managerial myopia. Therefore, firms with higher institutional ownership might need more incentive compensation for outside directors (Bryan et al., 2000). Since busy directors (who serve in multiple boards) might need more incentives to watch over managers due to their time constraints, we include the average number of directorships in our regressions. We also control for firm size. Our estimates show that board independence is positively related to stock compensation but not option compensation. It suggests that independent boards are more likely to align their incentives with shareholders using stock compensation. Average number of directorships held by outside directors is positively related to stock compensation consistent with the argument that busy directors might need the incentives to monitor effectively.

The results are similar for the sensitivity variables. For firms with higher percentage of independent directors, the sensitivity of director's wealth to stock price and volatility are higher. The higher the sensitivity of management's wealth to stock price, the higher is the sensitivity of director's wealth to stock price. Average number of directorships held by outside directors is negatively correlated with the sensitivity of director's wealth to stock price. Overall, we find that the structure of equity-based compensation – stock and option – for outside directors depends upon the firms' need for board oversight over

Table 2
Correlations

	Yield spread	Dir. stock and option comp.	Dir. stock comp.	Dir. option comp.	Dir. stock ownership	Dir. sensitivity to price	Dir. sensitivity to volatility	Mng. stock and option comp.	Mng. stock comp.	Mng. option comp.	Mng. stock ownership	Mng. option ownership	Mng. stock and option ownership
Yield spread	1.00												
Dir. stock and option compensation	-0.23	1.00											
Dir. stock compensation	-0.16	0.18	1.00										
Dir. option compensation	-0.08	0.70	-0.58	1.00									
Dir. stock ownership	-0.05	0.02	-0.01	0.03	1.00								
Dir. sensitivity to price	-0.17	0.07	0.03	0.04	0.72	1.00							
Dir. sensitivity to volatility	-0.19	0.51	-0.30	0.64	0.08	0.17	1.00						
Mng. stock and option compensation	-0.17	0.25	0.04	0.18	-0.07	0.11	0.25	1.00					
Mng. stock compensation	0.00	0.01	0.12	-0.07	-0.03	0.04	-0.05	0.31	1.00				
Mng. option compensation	-0.16	0.25	-0.04	0.23	-0.05	0.08	0.28	0.81	-0.31	1.00			
Mng. stock ownership	0.08	-0.09	-0.18	0.05	0.04	-0.01	-0.03	-0.11	-0.12	-0.03	1.00		
Mng. option ownership	0.29	0.04	-0.09	0.10	-0.04	-0.12	-0.10	0.11	-0.09	0.17	0.29	1.00	
Mng. stock and option ownership	0.21	-0.05	-0.18	0.08	0.01	-0.07	-0.08	-0.02	-0.13	0.06	0.85	0.72	1.00
Mng. sensitivity to price	-0.20	0.15	-0.11	0.21	0.00	0.14	0.26	0.20	-0.05	0.23	0.38	-0.04	0.25
Mng. sensitivity to volatility	-0.30	0.24	0.04	0.17	-0.09	0.06	0.36	0.36	-0.01	0.37	-0.06	-0.06	-0.06
Duration	-0.29	-0.02	0.11	-0.10	-0.01	-0.01	0.04	-0.03	0.01	-0.03	-0.11	-0.20	-0.19
Bond rating	-0.75	0.15	0.22	-0.03	0.04	0.19	0.18	0.21	0.03	0.19	-0.17	-0.42	-0.35
Bond age	0.07	0.03	0.04	-0.01	0.04	0.04	-0.04	-0.05	-0.05	-0.02	-0.09	0.00	-0.07
Size	-0.30	0.15	0.23	-0.04	-0.08	0.11	0.21	0.38	0.08	0.32	-0.20	-0.34	-0.32
Leverage	0.33	-0.14	-0.10	-0.05	0.02	-0.10	-0.15	-0.14	0.07	-0.18	0.06	0.18	0.14
ROA	-0.41	0.15	-0.02	0.14	0.03	0.14	0.23	0.10	0.02	0.09	0.02	-0.14	-0.07
Std. Dev. ROA	0.20	0.01	-0.07	0.06	-0.02	-0.02	-0.01	0.06	-0.03	0.08	-0.05	0.07	0.00
Q	-0.38	0.26	0.01	0.21	0.03	0.28	0.41	0.31	0.02	0.30	-0.05	-0.22	-0.15
Institutional ownership	0.04	0.09	0.08	0.02	-0.13	-0.09	-0.02	0.04	0.01	0.03	-0.24	0.02	-0.16
Board independence	-0.06	0.06	0.17	-0.07	0.03	0.04	0.10	0.06	0.04	0.03	-0.26	-0.14	-0.27
G-index	-0.07	-0.08	0.08	-0.13	-0.08	-0.10	-0.11	-0.07	-0.01	-0.06	-0.23	0.00	-0.16
Board size	-0.28	0.00	0.19	-0.14	0.14	0.19	0.12	0.11	0.10	0.05	-0.14	-0.27	-0.24
Director tenure	-0.03	-0.26	-0.13	-0.12	0.08	0.05	-0.11	-0.12	-0.01	-0.11	0.28	0.04	0.23
Number of directorships	-0.17	0.10	0.28	-0.12	-0.10	0.03	0.01	0.22	0.06	0.18	-0.25	-0.20	-0.29
Cash flow	-0.34	0.18	-0.03	0.17	0.00	0.06	0.22	0.13	0.00	0.13	0.05	-0.09	-0.02
Cash level	0.02	0.22	-0.07	0.23	-0.06	-0.02	0.26	0.18	-0.09	0.23	0.07	0.03	0.07
OI dummy	0.25	-0.08	-0.04	-0.04	-0.02	-0.02	-0.05	0.00	0.01	0.00	-0.03	0.02	-0.01
Sales growth	-0.14	0.04	-0.08	0.09	-0.01	0.02	0.14	0.01	-0.02	0.02	0.02	-0.07	-0.02
NOL dummy	0.05	-0.03	-0.04	0.01	0.09	0.10	0.03	-0.01	-0.06	0.03	0.01	-0.03	-0.01
R&D sales	-0.10	0.23	0.02	0.18	-0.06	0.00	0.29	0.27	-0.05	0.30	-0.10	-0.06	-0.10
Institutional investors	-0.12	0.05	0.06	0.00	0.11	0.19	0.07	0.09	0.04	0.07	-0.06	-0.08	-0.09
Investment bankers	0.02	-0.05	-0.03	-0.02	0.03	0.04	-0.03	0.03	0.05	0.00	-0.03	0.00	-0.03
Venture capitalists	0.04	0.16	-0.17	0.18	-0.01	0.03	0.13	0.06	-0.01	0.07	0.02	0.06	0.04

	Mng. sensitivity to price	Mng. sensitivity to volatility	Duration	Bond rating	Bond age	Size	Leverage	ROA	Std. dev. ROA	Q	Institutional ownership	Board independence	G-Index
Mng. sensitivity to price	1.00												
Mng. sensitivity to volatility	0.45	1.00											
Duration	−0.02	0.14	1.00										
Bond rating	0.19	0.38	0.26	1.00									
Bond age	−0.11	−0.01	−0.09	0.04	1.00								
Size	0.27	0.54	0.22	0.45	0.01	1.00							
Leverage	−0.21	−0.19	0.00	−0.44	−0.09	−0.16	1.00						
ROA	0.13	0.19	0.03	0.42	−0.04	−0.09	−0.04	1.00					
Std. dev. ROA	−0.04	−0.04	−0.13	−0.19	−0.01	−0.14	0.12	0.09	1.00				
Q	0.36	0.35	0.05	0.45	−0.02	0.14	−0.24	0.45	0.10	1.00			
Institutional ownership	−0.20	−0.12	−0.02	−0.04	0.06	−0.06	0.04	0.03	0.03	−0.06	1.00		
Board independence	−0.19	0.02	0.09	0.21	0.14	0.10	−0.18	0.03	0.05	0.05	0.22	1.00	
G-Index	−0.13	−0.10	0.07	0.09	0.08	−0.07	−0.03	0.00	−0.09	−0.09	0.18	0.27	1.00
Board size	0.14	0.30	0.25	0.40	0.01	0.49	−0.07	0.08	−0.13	0.14	−0.19	0.06	0.10
Director tenure	0.10	−0.09	−0.04	0.01	0.02	−0.12	−0.03	0.01	−0.13	−0.03	−0.15	−0.30	−0.01
Number of directorships	0.04	0.19	0.14	0.28	0.08	0.47	−0.14	−0.03	−0.04	0.08	0.11	0.28	0.11
Cash flow	0.15	0.16	−0.01	0.32	−0.03	−0.11	−0.10	0.46	0.04	0.52	0.09	0.03	−0.03
Cash level	0.17	0.16	−0.10	0.03	0.08	0.04	−0.28	0.07	0.31	0.32	0.01	0.02	−0.11
OI dummy	−0.02	0.01	−0.04	−0.16	0.11	0.01	−0.02	−0.31	0.17	−0.06	−0.06	0.01	−0.05
Sales growth	0.14	0.05	0.10	0.06	−0.20	0.11	0.01	0.16	−0.07	0.09	0.02	−0.21	−0.08
NOL dummy	0.07	0.06	−0.08	−0.07	0.01	0.03	0.02	−0.08	0.00	0.00	−0.04	−0.01	−0.01
R&D sales	0.08	0.20	0.01	0.12	0.04	0.15	−0.26	0.00	0.17	0.34	−0.01	0.15	−0.04
Institutional investors	0.04	0.13	0.10	0.14	0.02	0.16	−0.07	0.06	−0.07	0.10	0.03	−0.02	0.00
Investment bankers	0.10	0.07	0.00	−0.02	0.03	0.11	0.03	−0.04	0.00	−0.05	0.06	−0.13	−0.02
Venture capitalists	0.09	0.04	−0.03	−0.09	−0.07	−0.01	0.00	−0.01	0.09	0.09	0.00	−0.03	−0.13
	Board size	Director tenure	Number of directorships	Cash flow	Cash level	OI dummy	Sales growth	NOL dummy	R&D Sales	Institutional investors	Investment bankers	Venture capitalists	
Board size	1.00												
Director tenure	0.01	1.00											
Number of directorships	0.19	−0.20	1.00										
Cash flow	0.03	0.03	−0.03	1.00									
Cash level	−0.14	0.01	0.03	0.09	1.00								
OI dummy	−0.07	−0.03	0.07	−0.39	0.11	1.00							
Sales growth	0.05	−0.04	−0.08	0.14	−0.09	−0.15	1.00						
NOL dummy	0.04	−0.04	0.00	−0.07	−0.03	0.00	−0.03	1.00					
R&D sales	0.00	−0.07	0.11	0.03	0.43	0.06	−0.10	0.04	1.00				
Institutional investors	0.12	−0.04	0.19	0.04	0.03	0.00	0.02	−0.02	−0.02	1.00			
Investment bankers	0.03	0.08	0.07	−0.03	−0.06	0.00	0.03	−0.02	−0.06	0.40	1.00		
Venture capitalists	−0.07	−0.10	0.05	0.01	0.05	0.04	0.01	0.01	0.11	0.02	0.01	1.00	

This table presents pairwise correlations among all variables. Correlations that are significant at 5% level or below are in bold. All variables are defined in Appendix A.

Table 3

Determinants of director equity-based compensation

	Dir. option compensation	Dir. stock compensation	Log (Dir. sensitivity to price)	Log (Dir. sensitivity to volatility)
Leverage	–16.401 [0.13]	–13.996 [0.25]	–0.752 [0.08]*	–0.022 [0.96]
Q	4.812 [0.00]***	4.86 [0.00]***	0.35 [0.00]***	0.123 [0.01]**
R&D sales	101.135 [0.00]***	55.531 [0.18]	1.919 [0.38]	3.407 [0.00]***
Log (Dir. sensitivity to price)				0.095 [0.07]*
Log (Dir. sensitivity to volatility)			0.169 [0.01]**	
Log (Mng. sensitivity to price)			0.289 [0.00]***	0.122 [0.10]
Log (Mng. sensitivity to volatility)			–0.089 [0.03]**	0.054 [0.21]
Dir. stock compensation	–1.18 [0.00]***			
Dir. option compensation		–0.676 [0.00]***		
Dir. stock ownership	0.443 [0.21]	0.808 [0.01]**		
Mng. stock compensation	0.08 [0.46]	0.134 [0.17]		
Mng. option compensation	0.037 [0.68]	–0.126 [0.11]		
Mng. stock ownership	–0.585 [0.05]*	–1.345 [0.00]***		
Mng. option ownership	0.836 [0.06]*	1.436 [0.00]***		
NOL dummy	–0.635 [0.80]	1.759 [0.52]	0.316 [0.02]**	–0.074 [0.49]
Cash flow	38.911 [0.18]	10.727 [0.75]	–1.666 [0.23]	0.975 [0.47]
Cash level	32.177 [0.02]**	1.177 [0.94]	0.037 [0.95]	1.55 [0.00]***
EPS positive dummy	0.958 [0.89]	4.545 [0.61]	0.426 [0.03]**	–0.16 [0.69]
EPS exceed dummy	1.123 [0.79]	–0.151 [0.96]	–0.058 [0.69]	0.125 [0.56]
OI dummy	–16.537 [0.13]	–35.208 [0.31]	–1.184 [0.07]*	–0.111 [0.74]
Sales growth	5.714 [0.44]	–18.178 [0.01]***	0.315 [0.14]	0.632 [0.04]**
Board independence	14.77 [0.22]	19.898 [0.04]**	2.735 [0.00]***	2.115 [0.00]***
Institutional ownership	0.035 [0.71]	0.084 [0.35]	–0.006 [0.36]	–0.001 [0.79]
Number of directorships	1.202 [0.60]	4.268 [0.03]**	–0.292 [0.00]***	–0.12 [0.23]
Size	1.741 [0.27]	6.031 [0.00]***	0.233 [0.00]***	–0.063 [0.38]
Observations	716	716	716	716
Prob > chi ²	0.00	0.00	0.00	0.00
Pseudo R ²	0.09	0.12	0.13	0.11

This table presents the results of Tobit regressions on director stock and option compensation. Log(Dir. Sensitivity to Price), Log (Dir. Sensitivity to Volatility), Log (Mng. Sensitivity to Price), and Log (Mng. Sensitivity to Volatility) are the natural logs of Dir. Sensitivity to Price, Dir. Sensitivity to Volatility, Mng. Sensitivity to Price, and Mng. Sensitivity to Volatility, respectively. All other variables are defined in Appendix A. The number of observation is less than 783 due to missing data for EPS positive and EPS exceed dummies. All models include intercept, year dummies, and Fama and French (1997) industry dummies, but the coefficients are not reported. p-values based on bootstrapped standard errors are in brackets. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

managers as reflected by growth opportunities, free cash flow-based agency concerns, incentive pay for managers, firm size and other measures of board effectiveness such as independence and number of directorships.

4.2. Director compensation and yield spreads

In light of the above findings, we conduct the Durbin–Wu–Hausman (DWH) test to evaluate the severity of endogeneity of our director compensation variables. The test does not reject the null hypothesis that director compensation is exogenous in our

Table 4

Director compensation and yield spreads

	(1)	(2)	(3)
Dir. stock and option compensation	–0.016 [0.00]***		
Dir. stock compensation		–0.015 [0.00]***	
Dir. option compensation		–0.009 [0.00]***	
Dir. stock ownership	0.003 [0.71]	–0.002 [0.80]	
Mng. stock and option compensation	–0.004 [0.12]		
Mng. stock and option ownership	0.026 [0.00]***		
Mng. stock compensation		– 0.001 [0.81]	
Mng. stock ownership		–0.017 [0.09]*	
Mng. option compensation		–0.01 [0.00]***	
Mng. option ownership		0.091 [0.00]***	
Log (dir. sensitivity to price)			–0.234 [0.00]***
Log (dir. sensitivity to volatility)			–0.057 [0.22]
Log (mng. sensitivity to price)			–0.481 [0.00]***
Log (mng. sensitivity to volatility)			–0.001 [0.96]
Institutional investor	–2.546 [0.00]***	–2.161 [0.01]**	–2.514 [0.00]***
Investment banker	1.2 [0.25]	0.796 [0.44]	2.340 [0.02]**
Venture capitalist	0.979 [0.20]	0.442 [0.57]	1.963 [0.01]***
Duration	–0.069 [0.01]***	–0.068 [0.01]***	–0.077 [0.00]***
Bond rating residual	–0.387 [0.00]***	–0.39 [0.00]***	–0.375 [0.00]***
Bond age	0.006 [0.00]***	0.006 [0.00]***	0.004 [0.02]**
Size	–0.091 [0.15]	–0.113 [0.10]	0.101 [0.13]
Leverage	0.626 [0.14]	0.657 [0.12]	0.383 [0.38]
ROA	–4.357 [0.00]***	–4.35 [0.00]***	–4.023 [0.00]***
Std. dev. ROA	1.837 [0.42]	1.839 [0.43]	1.880 [0.41]
Q	0.06 [0.29]	0.056 [0.34]	0.175 [0.00]***
Sales growth	–0.611 [0.06]*	–0.595 [0.07]*	–0.432 [0.14]
Institutional ownership	0.001 [0.82]	–0.002 [0.55]	–0.004 [0.14]
Board independence	–0.733 [0.04]**	–0.568 [0.10]	–0.746 [0.04]**
G-Index	–0.051 [0.03]**	–0.072 [0.00]***	–0.071 [0.00]***
Board size	–0.139 [0.00]***	–0.11 [0.00]***	–0.107 [0.00]***
Director tenure	–0.089 [0.00]***	–0.068 [0.00]***	– 0.017 [0.24]
Observations	783	783	783
Adjusted R-squared	0.68	0.68	0.69

This table presents results of OLS regressions on yield spreads. Log (Dir. Sensitivity to Price), Log (Dir. Sensitivity to Volatility), Log (Mng. Sensitivity to Price), and Log (Mng. Sensitivity to Volatility) are the natural logs of Dir. Sensitivity to Price, Dir. Sensitivity to Volatility, Mng. Sensitivity to Price, and Mng. Sensitivity to Volatility, respectively. All other variables are defined in Appendix A. All models include intercept, year dummies, and Fama and French (1997) industry dummies, but the coefficients are not reported. *p*-values, which are reported in brackets, are based on standard errors corrected for heteroskedasticity and clustering of observations. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

sample. Moreover, given the difficulties researchers face in finding a set of instrumental variables that predict director compensation but are not correlated with the agency cost of debt, we begin with an ordinary least squares (OLS) test and postpone the simultaneous regression model to the next section.¹⁷

To test the cross-sectional relation between director compensation and yield spreads, we rely on Bhojraj and Sengupta (2003), Anderson et al. (2004), Klock et al. (2005), and Ortiz-Molina (2006) and run the following OLS regression with director stock and option compensation, director stock compensation, and director option compensation as the primary test variables:

$$\begin{aligned} \text{Yield spread}_{it} = & a_0 + a_1 \text{ Director compensation}_{it} + a_2 \text{ Dir. stock ownership}_{it} + a_3 \text{ Manager compensation}_{it} \\ & + a_4 \text{ Manager ownership}_{it} + a_5 \text{ Institutional investor} + a_6 \text{ Investment banker} + a_7 \text{ Venture capitalist} + \\ & + a_8 \text{ Duration}_{it} + a_9 \text{ Bond rating residual}_{it} + a_{10} \text{ Bond age}_{it} + a_{11} \text{ Size}_{it} + a_{12} \text{ Leverage}_{it} + a_{13} \text{ ROA}_{it} \\ & + a_{14} \text{ Std. dev. of ROA}_{it} + a_{15} Q_{it} + a_{16} \text{ Sales growth}_{it} + a_{17} \text{ Institutional ownership}_{it} \\ & + a_{18} \text{ Board independence}_{it} + a_{19} G\text{-index}_{it} + a_{20} \text{ Board size}_{it} + a_{21} \text{ Director tenure}_{it} \\ & + a_{22} \text{ Industry dummies}_{it} + a_{23} \text{ Year dummies}_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

In our panel dataset covering observations for 783 firm-years, the residuals may be correlated across years (time series dependence—a firm effect) for a given firm. Further, the residuals of a given year may be correlated across different firms (cross-sectional dependence—a time effect). Following Petersen (2006), we use time dummies for 2000 and 2001 to remove the correlation between observations in the same time period and report *p*-values based on White (1980) standard errors which are robust to within cluster correlation (Rogers, 1993 standard errors).¹⁸

Table 4 presents the results of OLS regressions. The coefficient estimate for *Dir. Stock and Option Compensation* is 0.016, indicating that the mean yield spread on outstanding bonds drops by 1.6 basis points for a marginal 1% increase in the ratio of director stock and option compensation to total compensation. When we separate the stock and option compensation components, the mean yield spread decreases by 1.5 basis points for a 1% increase in the ratio of stock compensation to total compensation. In our sample, the median firm with a *Dir. Stock Compensation* equal to 8% would pay approximately 12 basis points less on its public debt than firms that do not offer stock compensation to their directors. Moreover, *Dir. Option Compensation* is negatively related to yield spreads with a coefficient estimate of −0.009, indicating that the mean yield spread drops by 0.9 basis points at the margin. These results suggest that the monitoring effects of equity-based compensation for directors are stronger than the risk-shifting effects resulting in a net effect of a decrease in the cost of public debt. Furthermore, the results are consistent with the *form of compensation hypothesis* which posits that bondholders view stock compensation for outside directors more favorably (i.e., less risk-shifting incentives) than option compensation. A two-tailed test rejects the null hypothesis that the two coefficient estimates are equal to each other at 5% significance level. In other words, if a firm substitutes option compensation for stock compensation for outside directors, it would face a marginal increase of 0.6 (=1.5−0.9) basis points in yield spreads. Yet another implication of these results is that higher cash compensation for outside directors leads to higher debt costs. When we create a cash compensation variable which equals cash compensation divided by total compensation and include that in the regressions (instead of equity-based compensation variables), we find that cash compensation for directors is positively associated with yield spreads.

The overall negative effect of equity-based compensation for outside directors on yield spreads supports the monitoring rather than the risk-shifting hypothesis. These results are also consistent with the evidence presented in Bhojraj and Sengupta (2003), Anderson et al. (2004), and Ashbaugh-Skaife et al. (2006) and are complementary to the effect of corporate governance and monitoring incentives on debt costs. Further, the lower coefficient estimate on outside director option compensation is consistent with the trade-offs discussed in John and John (1993) and Bryan et al. (2006). However, the aggregate negative relation between yield spreads and director compensation is in stark contrast to the positive relation between bond yield risk premium and managerial compensation structure predicted by John and John (1993).

As for managerial compensation, we find significant and negative association between managerial option compensation (*Mng. Option Compensation*) and yield spreads. This result suggests that a marginal 1% increase in equity-based compensation for managers decreases yield spreads by 1 basis points. In sharp contrast, managerial stock and option ownership, which basically captures *cumulative* compensation awards over top-managements tenure at the firm, is significantly *positively* associated with debt yields. At the margin, a 1% increase in management option and stock ownership will result in 2.6 basis points increase in the mean yield spreads. The estimates reported in the second column suggest that this positive effect is primarily attributable to managerial option ownership (with a coefficient estimate of 0.091), whereas managerial stock ownership is significantly negatively related to yield spreads. The aggregate result is consistent with the positive relation between bond yield risk premium and managerial ownership of levered stocks and options predicted by John and John (1993). They are also consistent with the evidence in Ortiz-Molina (2006), but his analysis is limited to managerial stock and option ownership and does not cover the effects of managerial incentive compensation on yield spreads.

How can we reconcile the aggregate negative effects of annual director and managerial incentive pay on yield spreads with the positive effects of their ownership of stocks and options? One plausible explanation is that *annual* option compensation is

¹⁷ Wooldridge states, “[there is an] important cost of performing the instrumental variable (IV) estimation when *x* and *u* are uncorrelated: the asymptotic variance of the IV estimator is always larger, and sometimes much larger, than the asymptotic variance of the OLS estimator” (Wooldridge, 2003, p.490). If the OLS estimator is biased and inconsistent, however, this loss of efficiency is a price worth paying (Baum et al., 2003; Baum, 2006).

¹⁸ Our results remain qualitatively similar when we recalculate standard errors using the Thompson (2005) method to adjust for clustering based on year and firm.

incremental in relation to the accumulated option ownership over the years. Moreover, annual pay awards are subject to more restrictive vesting and transfer rules than those captured by the accumulated ownership stakes. Our estimates imply that the managerial (as well as directors) option compensation in smaller annual doses does not much stimulate risk-shifting incentives. But when it grows over the years into larger ownership stakes (comprised of standard stocks and options with few restrictions), it raises creditors' concerns about the quality of debt. These findings are consistent with the notion that while rational bondholders regard the *annual option* compensation for top management favorably, they view the *cumulative effects* of the significantly higher pay-performance sensitivity of option compensation as biasing managerial decisions in favor of more risky investment and financial policies.

Another potential explanation for our puzzling empirical observations is similar to the one offered by [Strebulaev \(2007\)](#) with respect to dynamic capital structure policies. If firms adjust their compensation policies infrequently due to rebalancing costs in the presence of significant agency and other frictions, then the incentive pay at most firms would likely differ from the 'optimum' compensation derived from a static model due to the dynamic evolution of firms. This could result in a (dramatically different) negative relation in a dynamic cross section between yield spreads and director and managerial incentive compensation even when the two variables are positively correlated in the static equilibrium. In other words, our observed negative sign may be the result of dynamic transitory variation rather than the long-term relation.

We also examine the cross-sectional relation between yield spreads and the sensitivity of director's wealth (due to compensation from the firm) to changes in stock price and stock price volatility. The results of the OLS regression are presented in the third column of [Table 4](#). *Log (Dir. Sensitivity to Price)*, which is the sensitivity of directors' wealth to 1% change in stock price, is significantly negatively associated with yield spreads. For managers, the sensitivity of their wealth to a change in stock price (*Log (Mng. Sensitivity to Price)*) is also negatively related to yield spreads, consistent with stock ownership results.¹⁹ However, the coefficient estimate on *Log (Mng. Sensitivity to Volatility)* (sensitivity of managers' wealth to stock price volatility) is not significant. These results suggest that the previously noted positive effects of managerial option ownership on yield spreads are not driven by the delta and vega of incentive options.

As for the percentage of outside directors who are institutional investors, investment bankers, or venture capitalists, we find that percentage of institutional investors serving on the board is negatively related to yield spreads. The coefficient estimate for percentage of venture capitalists on the board is positive and significant only in the regressions with sensitivity variables. Overall, we find that even after we control for the percentage of outside directors affiliated with financial institutions, our results on the effect of director compensation on yield spreads hold.

To minimize the risk that the observed negative relation between yield spreads and director compensation is due to firm and bond characteristics rather than to the test variables, we use several control variables. The coefficient estimate for residual bond ratings is negative and significant, consistent with the notion that lower bond ratings reflect higher default risk. Duration increases with maturity and decreases with coupon and yield to maturity. Interactions between these variables might result in a negative or positive sign ([Anderson et al., 2004](#)). We find that the coefficient estimate on duration is significantly negative. The coefficient estimates for ROA (measuring operating income) and sales growth are negative, and that for bond age (our proxy for secondary market trading illiquidity) is positive and significant, as expected. Consistent with [Bhojraj and Sengupta \(2003\)](#), the coefficient estimate for percentage of independent directors is negative and significant in two specifications. Analogous to [Klock et al. \(2005\)](#), the [Gompers et al. \(2003\)](#) shareholder rights index (*G-Index*) is negative and significant in all specifications, implying lower yields for firms that are better protected from takeover threats. We find weak support to the argument that higher Tobin's Q, implying higher risk-shifting incentives, should be positively correlated with spreads. Similar to [Anderson et al. \(2004\)](#), our evidence shows that larger boards are associated with lower yield spreads. But contrary to their results, we find a negative relation between average director tenure and yield spreads. A plausible explanation is that director tenure is positively correlated with experience on the board and effective monitoring of managers.

It is possible that at high ownership levels managers and directors may deviate from value-maximization ([Morck et al., 1988](#), and [Ortiz-Molina, 2006](#)). In untabulated results, we repeat our regressions including the squared terms of compensation and ownership variables but could not find any evidence of non-linear effects for both director compensation and ownership variables.²⁰

4.3. Debt quality and director compensation

Our *default risk hypothesis* posits that, if incentive pay strengthens the director's monitoring incentives, investors in poorly-rated debt would view equity-based compensation, especially stock grants, more favorably than their counterparts holding high-quality debt. However, if the risk-shifting incentives dominate, then we would see the yield spreads widen for poorly-rated firms. To test the interaction between debt quality and director compensation, we create a dummy variable that takes the value of one if the Moody's average bond rating for the firm is A3 or better, and zero otherwise (*High Grade Dummy*). We interact this debt quality variable with our director compensation variables. A positive coefficient on this

¹⁹ We use natural logs of the sensitivity variables in our analyses to normalize their skewed distributions.

²⁰ We have also rerun the regression specification presented in the third column of [Table 4](#) including squared terms of the sensitivity variables. In untabulated results, the coefficient estimate of *Log (Mng. Sensitivity to Price)* was negative and significant and the coefficient estimate of its squared term was positive and significant. On the contrary, the coefficient estimate of *Log (Mng. Sensitivity to Volatility)* was positive and significant and the coefficient estimate of its squared term was negative and significant.

Table 5

Director compensation and the quality of debt

	(1)	(2)
Dir. stock and option compensation	–0.018 [0.00]***	
High grade dummy*dir. stock and option compensation	0.007 [0.00]***	
Dir. stock compensation		–0.017 [0.00]***
Dir. option compensation		–0.011 [0.00]***
High grade dummy*dir. stock compensation		0.007 [0.05]**
High grade dummy*dir. option compensation		0.007 [0.00]***
Dir. stock ownership	0.002 [0.84]	–0.004 [0.70]
Mng. stock and option compensation	–0.005 [0.06]*	
Mng. stock and option ownership	0.029 [0.00]***	
Mng. stock compensation		–0.001 [0.81]
Mng. stock ownership		–0.015 [0.10]
Mng. option compensation		–0.011 [0.00]***
Mng. option ownership		0.101 [0.00]***
Institutional investor	–2.926 [0.00]***	–2.498 [0.00]***
Investment banker	1.409 [0.18]	0.96 [0.36]
Venture capitalist	1.353 [0.09]*	0.76 [0.34]
Observations	783	783
Adjusted R-squared	0.68	0.68

This table presents results of OLS regressions on yield spreads. *High Grade Dummy* is a dummy variable that takes the value of one if average Moody's bond rating is greater than or equal to A3 and zero otherwise. *High Grade Dummy*Dir. Stock and Option Compensation* is an interaction variable of *Dir. Stock and Option Compensation* and *High Grade Dummy*. Similarly *High Grade Dummy*Dir. Stock Compensation* and *High Grade Dummy*Dir. Option Compensation* are interaction variables. All other variables are defined in Appendix A. All models include intercept, year dummies, and Fama and French (1997) industry dummies, but the coefficients are not reported. All models include the following issue and firm specific control variables: *Duration*, *Bond rating residual*, *Bond age*, *Size*, *Leverage*, *ROA*, *Std. Dev. ROA*, *Q*, *Sales growth*, *Institutions*, *Independence*, *G-Index*, *Board size*, and *Director tenure*. The coefficients of these variables are not reported. *p*-values, which are reported in brackets, are based on standard errors corrected for heteroskedasticity and clustering of observations. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

interaction variable would indicate that the monitoring incentives of equity-based compensation for outside board members are more important for firms with poor debt quality. From Table 5 (for brevity the coefficients of issue and firm specific control variables are not reported), the coefficient estimates on the three interaction variables are all positive and significant, suggesting that the monitoring incentives provided by equity-based compensation for outside directors are more important for firms with poor debt quality. For example, for firms with low grade bonds, the mean yield spread drops 1.8 basis points for a 1% increase in stock and option compensation for outside directors. But the corresponding decrease for firms with high grade bonds is 1.1 basis points (as indicated by the coefficient of 0.007 for *High Grade dummy*Dir. Stock and Option Compensation*).

5. Robustness checks

We conduct the following additional tests to ensure that the observed negative relationship is not the result of omitted or unobservable firm or board characteristics that happen to be correlated with director compensation.

5.1. Endogeneity

It can be argued that firms evaluate the costs and benefits of each pay-for-performance mechanism and adopt the best form for their characteristics (Linn and Park, 2005; Bryan et al., 2006). In competitive equilibrium, corporate boards would set pay packages optimally to minimize the agency cost of debt, and we would expect yield spreads to be unrelated to the outside director compensation structure. This implies the coefficients on the test variables would be zero in equilibrium. In contrast, extant evidence reviewed earlier seems to suggest that boards may not monitor effectively due to managerial power over the board.

Table 6

Two-stage least squares regressions

	(1)	(2)	(3)
Dir. stock and option compensation	-0.038 [0.00]***		-0.04 [0.00]***
Dir. stock compensation		-0.046 [0.02]**	
Dir. option compensation		-0.021 [0.07]*	
Dir. stock ownership	0.018 [0.19]	-0.001 [0.95]	0.015 [0.26]
High grade dummy*dir. stock and option compensation			0.014 [0.00]***
Mng. stock and option compensation	-0.002 [0.54]		-0.004 [0.25]
Mng. stock and option ownership	0.027 [0.00]***		0.034 [0.00]***
Mng. stock compensation		0.001 [0.72]	
Mng. option compensation		-0.016 [0.00]***	
Mng. stock ownership		-0.024 [0.05]**	
Mng. option ownership		0.124 [0.00]***	
Institutional investor	-2.572 [0.01]***	-1.692 [0.12]	-3.279 [0.00]***
Investment banker	0.322 [0.79]	0.196 [0.88]	0.766 [0.52]
Venture capitalist	1.773 [0.10]	0.715 [0.53]	2.419 [0.04]**
Observations	783	783	783

This table presents the second stage results of two-stage least squares regression in which the dependent variable is yield spread and director compensation variables are endogenous. We use cash flow, cash level, number of directorships, NOL dummy, OI dummy, and R&D over sales from Table 3 as instruments. *High Grade Dummy* is a dummy variable that takes the value of one if average Moody's bond rating is greater than or equal to A3 and zero otherwise. *High Grade Dummy*Dir. Stock and Option Compensation* is an interaction variable of *Dir. Stock and Option Compensation* and *High Grade Dummy*. All other variables are defined in Appendix A. All models include intercept, year dummies, and Fama–French (1997) industry dummies, but the coefficients are not reported. All models include the following issue and firm specific control variables: *Duration*, *Bond rating residual*, *Bond age*, *Size*, *Leverage*, *ROA*, *Std. Dev. ROA*, *Q*, *Sales growth*, *Institutions*, *Independence*, *G-Index*, *Board size*, and *Director tenure*. The coefficients of these variables are not reported. *p*-values, which are reported in brackets, are based on standard errors corrected for heteroskedasticity and clustering of observations. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

Accordingly, many studies assume that the governance regimes in place may be suboptimal and investigate the effects of managerial and board pay schemes on firm performance.

In contrast to the zero equilibrium coefficients, we have so far observed significant negative coefficients on the board compensation variables, implying that in the aggregate incentive compensation is underutilized. One potential explanation for the observed negative coefficients may be that our empirical regression in (2) is misspecified because director and manager ownership and compensation decisions and the yield spreads are endogenously determined. For instance, John and John (1993) argue that compensation and ownership structures of the firms are determined simultaneously with capital structure. In other words, firms facing high cost of debt might prefer to increase the equity-based incentives for directors and managers. In order to address the issue of endogeneity, we run the following two-stage least squares regression to endogenize the director compensation variables:²¹

$$\begin{aligned} \text{Director compensation}_{it} = & a_0 + a_1 \text{Dir. stock ownership}_{it} + a_2 \text{Manager compensation}_{it} \\ & + a_3 \text{Manager ownership}_{it} + a_4 \text{Number of directorships}_{it} + a_5 \text{Cash level}_{it} + a_6 \text{Cash flow}_{it} \\ & + a_7 \text{R\&D Sales}_{it} + a_8 \text{NOL dummy} + a_9 \text{OI dummy} + a_{10} \text{Controls}_{it} + a_{11} \text{Industry dummies}_{it} \\ & + a_{12} \text{Year dummies}_{it} + \varepsilon_{it} \end{aligned} \quad (3)$$

$$\begin{aligned} \text{Yield spread}_{it} = & a_0 + a_1 \text{Director compensation}_{it} + a_2 \text{Dir. stock ownership}_{it} + a_3 \text{Manager compensation}_{it} \\ & + a_4 \text{Manager ownership}_{it} + a_5 \text{Controls}_{it} + a_6 \text{Industry dummies}_{it} + a_7 \text{Year dummies}_{it} + \varepsilon_{it}, \end{aligned} \quad (4)$$

where *Controls* include duration, bond rating residual, bond age, size, leverage, ROA, standard deviation of ROA, sales growth, Q, institutional ownership, percentage of independent directors, G-Index, board size, and director tenure.

²¹ Eq. (3) is similar to the Tobit regression specification in Table 3. Following Bryan and Klein (2004), we run two-stage least squares regressions (both stages OLS) rather than first stage Tobit, second stage OLS. As noted earlier, the OLS results are similar to Tobit regression results reported in Table 3.

Table 7
Director compensation and risk

	(1) Change in acquirer risk	(2) Change in acquirer risk	(3) Log (Variance of stock returns _{t+1})	(4) Log (Variance of stock returns _{t+1})
Dir. stock and option compensation	0.0002 [0.01]**		0.03 [0.00]***	
Dir. stock compensation		0.0003 [0.02]**		0.03 [0.08]*
Dir. option compensation		0.0003 [0.01]***		0.03 [0.00]***
Dir. stock ownership	0.0002 [0.97]	−0.0013 [0.84]	−0.024 [0.06]*	−0.026 [0.04]**
Board independence	0.0069 [0.64]	0.0022 [0.87]	−0.161 [0.63]	−0.117 [0.72]
Board size	−0.0004 [0.62]	0.0003 [0.82]	−0.009 [0.68]	−0.008 [0.72]
Director tenure	0.0004 [0.55]	0.0004 [0.53]	0.042 [0.06]*	0.039 [0.08]*
G-Index	0.0001 [0.86]	0.0004 [0.59]	−0.02 [0.32]	−0.017 [0.39]
Institutional investor	−0.0239 [0.65]	−0.0177 [0.72]	−0.769 [0.30]	−0.727 [0.34]
Investment banker	0.0611 [0.23]	0.0730 [0.17]	1.135 [0.31]	1.244 [0.27]
Venture capitalist	0.0174 [0.65]	0.0079 [0.81]	−0.813 [0.33]	−0.756 [0.39]
Observations	67	67	783	783
Adjusted R-squared	0.14	0.16		

This table presents the OLS regression results on change in acquirer risk and two-stage least squares regression results of future volatility of stock returns. For the models with change in acquirer risk as dependent variable, all independent variables are measures for the year-end preceding the acquisition announcement. We compute the standard deviation of stock returns for two time periods: post-acquisition period and pre-acquisition period. We define the post-acquisition period as 11 to 70 days after the effective date and the pre-acquisition period as 120 days to 60 days before the announcement date. Change in acquirer risk is the difference between post-acquisition period standard deviation of stock returns and pre-acquisition period standard deviation of stock returns. Durbin–Wu–Hausman test does not reject exogeneity of the director compensation measures for the first two models, so we use OLS. In the last two models, the dependent variable is the log of future variance of daily stock returns and director compensation variables are endogenous. We use cash level, number of directorships, and R&D over sales as instruments. All models include the following control variables: managerial compensation and ownership variables, *Size*, *Leverage*, *Q*, and *Cash flow*. The coefficient estimates for these variables are not reported. All models also include year dummies, *Fama and French (1997)* industry dummies, and intercept, but the coefficient estimates are not reported. *p*-values, which are reported in brackets, are based on standard errors corrected for heteroskedasticity and clustering of observations. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 6 reports the second stage estimates (for brevity the coefficients of issue and firm specific control variables are not reported). Similar to the results reported in Table 4, the outside director equity-based compensation is negatively related to yield spreads. While both stock and option compensation is associated with lower yield spreads on average, the effect is larger for stock compensation. We also find that the higher the managerial option ownership, the higher are the average yield spreads. These findings suggest that our main results are robust to endogeneity concerns. The results also indicate that the effect of equity-based compensation for outside directors on yield spreads is stronger for firms with lower-rated debt.

5.2. Sample selection

The sample we use for the analysis includes only firms that have public debt outstanding. Therefore, one can argue that this selection of firms with public debt might bias the coefficient estimates. To address this issue, we run a Heckman selection model, where the selection equation is whether the firm (out of all non-financial, non-utility COMPUSTAT firms) is in our sample (i.e., has public debt) or not. *Faulkender and Petersen (2006)* argue that listing on NYSE and inclusion in S&P 500 increase the visibility of the firm and thus its likelihood of issuing public bonds. Further, they argue that as the firm ages, it becomes better known to the market and this can expand its access to public bond markets. Accordingly, we use dummy variables for NYSE-listing, inclusion in S&P 500, and natural logarithm of firm age as instruments. The other independent variables included in the first stage are size, market-to-book ratio, ROA, standard deviation of ROA, leverage, year and industry dummies. From the first stage we calculate the inverse Mills ratio and include it as an additional variable in the second stage (Eq. (2)). Consistent with our OLS results, we find that both director stock compensation and option compensation are negatively related to yield spreads. The coefficient estimate on director stock compensation is larger than that on option compensation. The results related to the quality of debt also hold. These results suggest that our results are not driven by sample selection issues.²²

²² We also estimate a model which considers both endogeneity and selection bias. Following the methodology outlined in *Wooldridge (2002)*, we include the inverse Mills ratio from the selection equation as an instrumental variable in the two-stage least squares regression. We use the same instruments that we have used in two-stage least squares and the sample selection model. The results remain qualitatively similar.

5.3. Director compensation and risk

To provide more direct evidence for the argument that director equity-based compensation is likely to increase risk-taking incentives of outside directors, we perform two additional tests. First, following Datta et al. (2001) we identify firms in our sample that announced the acquisition of other firms in 2001, 2002, and 2003 and examine the relation between outside director compensation and risk-increasing acquisitions. All the independent variables in this test are measured for the year-end preceding the acquisition announcement. We compute the standard deviation of stock returns of the acquirer for the post-acquisition period (11 to 70 days after the effective date of the acquisition) and the pre-acquisition period (120 days to 60 days before the announcement date of the acquisition). To estimate the change in acquirer risk, we subtract the pre-acquisition standard deviation of returns from the post-acquisition standard deviation. Then we regress the change in acquirer risk on the pre-event director compensation and control variables and report the results in the first and second columns of Table 7. It is plausible that board characteristics such as board independence, board size, and director tenure are related to risk-shifting incentives as well. For example, a larger board or a board with fewer independent directors might monitor less and allow excessive risk taking. To examine the effect of board characteristics on risk-taking incentives, we include board independence, board size, and director tenure, in the tests we described above. Controlling for leverage, Tobin's Q, size, cash flow, managerial ownership and compensation, and industry and year effects (for brevity the coefficients of control variables are not reported), we find that both director stock and option compensation are positively related to acquisition risk, supporting the argument that equity-based compensation might motivate directors to approve managers' risky investment choices.

The second test follows Coles et al. (2006) and is a more general test of the effect of director compensation on firm risk. We regress the future volatility of stock returns on the predicted values of director compensation and control variables. From the third and fourth columns of Table 7, we find that director option compensation is positively related to future volatility of stock returns. The coefficient on director stock compensation is positive but weakly significant. These results provide evidence that equity-based compensation, especially option compensation, might increase risk-taking incentives of directors. In contrast, director stock ownership seems to dampen risk-taking. Overall, these results imply option compensation and (to a weaker extent) even stock-based pay to outside directors are associated with risky investment and financing choices. Presumably, more risky policies lead to higher average returns. How can we reconcile these risk-increasing effects with our main result of lower yield spreads for both stock and option compensation for outside directors (see Table 4)? Our interpretation is that both types of incentive compensation are effective in mitigating the problems of under- and overinvestment through improved board oversight. Consequently, for both pay schemes the return-increasing effects dominate the risk-increasing effects, thus lowering the cost of debt capital. But the dominance is more pronounced for stock compensation, resulting in a larger decrease in yield spreads reported in Table 4.

5.4. Alternative measures and specifications

We conducted the following additional robustness tests. First, the director compensation variables used in this paper include the initial stocks and options granted to the outside directors appointed during that year. However, including these additional options might increase the percentage of equity-based compensation more than it should since not all directors will get these additional stocks and options, but only the directors who are appointed that year will get them. Therefore, we repeated our tests without including these one-time grants and found qualitatively similar results. Second, we reran the two-stage least squares regressions with the first stage Tobit and second stage ordinary least squares and obtained results similar to the two-stage least squares results reported in Table 6. Third, we performed *change* regressions to further address the endogeneity concerns. The dependent variable in these regressions is the change in yield spread, and the independent variables are the changes in compensation variables, as well as the changes in the issue and firm specific variables. The sample size drops to 408 observations in this analysis. In untabulated results, the coefficient estimates of *Dir. Stock and Option Compensation* and *Dir. Option Compensation*, are negative and significant; the coefficient estimate for *Dir. Stock Compensation* is negative but not significant at conventional levels. Finally, we ran our yield spread regressions including Altman's (1968) Z-score to control for financial distress and found qualitatively similar results. In sum, these tests increase our confidence that the observed dominance of monitoring over risk-shifting incentives of outside director compensation resulting in lower yield spreads is robust rather than just a spurious relation.

6. Conclusion

In this paper we examine how equity-based compensation for external directors affects shareholder-bondholder conflicts. In the past 10 years, there has been a substantial increase in equity-based incentives for outside directors to align their incentives with those of shareholders. Although there is evidence that equity-based incentives achieve this objective (Fich and Shivasani, 2005), there is little direct evidence on how equity-based compensation for outside directors impacts bondholders. On one hand, equity-based incentives for external board members increase their monitoring incentives, which would also benefit bondholders. On the other hand, equity-based compensation has a side effect of increasing the likelihood of risk-shifting, which would hurt bondholders.

We present three important results. First, our findings show that both stock and option compensations for outside directors increase monitoring incentives as compared with cash compensation. Second, the monitoring incentives induced by stock grants

to outside board members are stronger than those induced by options. In our sample, a 1% increase in director stock compensation is associated with a 1.5 basis point decrease in average yield spreads, while a similar increase in director option compensation is associated with a 0.9 basis points decrease. Finally, we examine the interaction effects between stock and option compensations for debt with different quality ratings. Our evidence suggests that the effect of equity-based compensation on yield spreads is stronger for lower-rated firms, implying that the monitoring incentives induced by equity-based compensation to outside directors are more important when the company's debt is of low quality.

Appendix A. Variable definitions

Variable name	Description and source
<i>Yield Spread</i>	The difference between the weighted average yield on the firm's outstanding debt and the yield on a Treasury security with a similar duration. <i>Source:</i> Mergent Bond Record
<i>Total Director Compensation</i>	(Director meeting fee*number of meetings)+annual director retainer +(director stock grants*average stock price during the grant year)+Black–Scholes value of option grants. <i>Source:</i> Execucomp
<i>Dir. Stock and Option Compensation</i>	[(Director stock grants*average stock price during the grant year)+Black–Scholes value of options]/Total director compensation. <i>Source:</i> Execucomp
<i>Dir. Option Compensation</i>	Black–Scholes value of options/Total director compensation. <i>Source:</i> Execucomp
<i>Dir. Stock Compensation</i>	(Director stock grants*average stock price during the grant year)/Total director compensation. <i>Source:</i> Execucomp
<i>Dir. Stock Ownership</i>	Number of shares owned by outside directors/Number of shares outstanding. <i>Source:</i> Proxy statements
<i>Dir. Sensitivity to Price</i>	Sensitivity of outside directors' wealth to 1% change in stock price. <i>Source:</i> Calculated using data from Execucomp
<i>Dir. Sensitivity to Volatility</i>	Sensitivity of outside directors' wealth to 0.01 change in stock price volatility. <i>Source:</i> Calculated using data from Execucomp
<i>Mng. Stock and Option Compensation</i>	(Black–Scholes value of options granted to top 5 executives during the year+value of restricted stock granted during the year)/Total compensation. Total compensation (TDC1 in Execucomp) comprises salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using Black–Scholes), long-term incentive payouts, and all other total. <i>Source:</i> Execucomp
<i>Mng. Option Compensation</i>	Black–Scholes value of options granted to top 5 executives during the year/Total compensation. <i>Source:</i> Execucomp
<i>Mng. Stock Compensation</i>	Value of restricted stock granted during the year/Total compensation. <i>Source:</i> Execucomp
<i>Mng. Stock and Option Ownership</i>	(Number of shares owned by top 5 executives+number of stock options granted+number of unexercised options held at year end (both vested and not vested))/Number of shares outstanding. <i>Source:</i> Execucomp
<i>Mng. Option Ownership</i>	(Number of stock options granted+number of unexercised options held at year end (both vested and not vested))/Number of shares outstanding. <i>Source:</i> Execucomp
<i>Mng. Stock Ownership</i>	Number of shares owned by top 5 executives/Number of shares outstanding. <i>Source:</i> Execucomp
<i>Mng. Sensitivity to Price</i>	Sensitivity of top management's wealth to 1% change in stock price. <i>Source:</i> Calculated using data from Execucomp
<i>Mng. Sensitivity to Volatility</i>	Sensitivity of top management's wealth to 0.01 change in stock price volatility. <i>Source:</i> Calculated using data from Execucomp
<i>Institutional Investor</i>	Percentage of institutional investors on the board. <i>Source:</i> 13F filings, proxy statements
<i>Investment Banker</i>	Percentage of investment bankers on the board. <i>Source:</i> SDC, proxy statements
<i>Venture Capitalist</i>	Percentage of venture capitalists on the board. <i>Source:</i> SDC, proxy statements
<i>Duration</i>	Macaulay duration of the outstanding bonds (weighted average). <i>Source:</i> Calculated using data from Mergent Bond Record
<i>Bond rating residual</i>	Residual from the regression where the dependent variable is bond rating and independent variables are compensation and governance variables. Bond rating (weighted average) is Moody's bond rating converted to a number scale, where Aaa1 is 23 and D is 1. <i>Source:</i> Mergent Bond Record
<i>Bond age</i>	The length of time the bond has been outstanding in months (weighted average). <i>Source:</i> Mergent Bond Record
<i>Size</i>	Log of total assets. <i>Source:</i> Compustat
<i>Leverage</i>	Long-term debt/Book value of total assets. <i>Source:</i> Compustat
<i>ROA</i>	Operating income before depreciation/Total assets. <i>Source:</i> Compustat
<i>Std. Dev. ROA</i>	Standard deviation of ROA from $t-6$ to $t-1$. <i>Source:</i> Compustat
<i>Q</i>	[Book value of total assets+(market value of equity–book value of equity)]/Book value of assets. <i>Source:</i> Compustat
<i>Institutional ownership</i>	Percentage of institutional ownership. <i>Source:</i> The Corporate Library
<i>Board independence</i>	Percentage of independent directors. A director is classified as independent if he/she is 1) not currently employed by the company, 2) not a currently affiliated with the company as a consultant, legal representative or in any other similar commercial capacity, 3) not an owner or beneficiary of an entity that profits directly from the actions or activities of the company, 4) not a former executive of the company [The Corporate Library]. <i>Source:</i> Proxy statements, The Corporate Library
<i>G-Index</i>	Gompers, Ishii, Metrick (2003) shareholders rights index
<i>Board size</i>	Number of directors on the board. <i>Source:</i> Proxy statements, The Corporate Library
<i>Director tenure</i>	Average director tenure. <i>Source:</i> Proxy statements, The Corporate Library
<i>Number of directorships</i>	Average number of directorships held by outside directors. <i>Source:</i> Proxy statements, The Corporate Library
<i>Cash flow</i>	Operating income before depreciation less the sum of income tax, interest and dividends / Book value of assets. <i>Source:</i> Compustat
<i>Cash level</i>	Cash and cash equivalents / Book value of assets. <i>Source:</i> Compustat
<i>OI dummy</i>	A dummy variable that takes the value of one if the operating income before depreciation is less than zero, and zero otherwise. <i>Source:</i> Compustat
<i>Sales growth</i>	Log (Sales _{<i>t</i>} /Sales _{<i>t-1</i>}). <i>Source:</i> Compustat
<i>NOL dummy</i>	A dummy variable that takes the value of one if the firm has net operating loss carry-forward in its balance sheet, and zero otherwise. <i>Source:</i> Compustat
<i>R&D sales</i>	Max [(Research and development expenses / Sales), 0]. <i>Source:</i> Compustat

Appendix A (continued)

Variable name	Description and source
<i>EPS positive dummy</i>	A dummy variable that takes the value of one if split adjusted earnings per share (Compustat #58/Compustat #27) is greater than or equal to zero, and the split adjusted earnings per share minus pro forma employee stock options per share disclosed in SFAS 123 footnote (Compustat #399/Compustat #54*Compustat #27) is less than zero. Source: Compustat
<i>EPS exceed dummy</i>	A dummy variable that takes the value of one if split adjusted earnings per share (Compustat #58/Compustat #27) is greater than or equal to last year's earnings per share, and the split adjusted earnings per share minus pro forma employee stock options per share disclosed in SFAS 123 footnote (Compustat #399/Compustat #54*Compustat #27) is less than last year's earnings per share. Source: Compustat

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