Consequences of CEO Overconfidence

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Abstract

We test the impact of CEO overconfidence on the cost of debt and the impact of SOX on overconfidence via CEO selection. Our CEO overconfidence measure is based on the degree of optimism in management earnings forecasts, and the measure for the cost of debt is bond yield spreads. Our evidence supports that the market discounts CEO overconfidence by increasing the cost of borrowing. Moreover, we find that the financial market also incorporates past CEO overconfidence into bond pricing. We document that the board prefers to appoint a more rational CEO over an overconfident CEO. Our findings are consistent with Banerjee et al.'s (2015) argument that an independent board mitigates the costs of CEO overconfidence in terms of investment and risk exposure.

Keywords: CEO overconfidence, Cost of debt, Management earnings forecast, Yield spreads, Sarbanes-Oxley Act

1. Introduction

Optimistic bias (overconfidence) has been shown to be a normal and systematic tendency for people to be overly optimistic in regards to future outcomes, especially those for which they have significant influence or control (Armor and Taylor 2002). For corporate management, this tendency may be problematic (Lovallo and Kahneman 2003). Recent literature has documented that executive overconfidence impairs financial decisions. Malmendier and Tate (2008) have provided evidence that overconfident CEOs overpay for target companies and undertake value-destroying mergers. While overconfident CEOs overestimate their own abilities, they neglect their competitors' skills and underestimate their competitors' strategic countermoves. Accordingly, overconfidence leads to overinvestment, such as excess entry into markets, overpayment in acquisitions, or imprudent capacity expansions (Zajac and Bazerman 1991). One example of overpaying for target companies is VeriSign's acquisition of Network Solutions.

> VeriSign Inc. agreed to acquire Network Solutions Inc. for $21 billion in stock Tuesday, creating an online powerhouse that can shepherd companies onto the Internet and help them establish and maintain their e-commerce identity. **…** While conceding that VeriSign stands to gain invaluable access to Network Solutions' 8.1-million-member subscriber base, which it can then leverage to sell their other products, Merrill Lynch analyst Mark Fernandes said there are lingering questions as to whether VeriSign could have accomplished the goal for less money by establishing a partnership instead. (March 7, 2000 *CNN News*) (Note 1)

Three years later, VeriSign sold its Network Solutions business for only $100 million. (Note 2)

On the other hand, some researchers (e.g., Bénabou and Tirole 2002; Brunnermeier and Parker 2005; Compte and Postlewaite 2004; Gervais and Goldstein 2007; Gervais et al. 2007) have argued that overconfidence is an optimal endogenous behavior choice by individuals in a corporate setting. Overconfident CEOs have the courage to take risks and make changes necessary for a company to remain competitive. Galasso and Simcoe (2009) also have also provided empirical evidence that overconfident CEOs are more likely to innovate than rational CEOs in terms of patents. In addition, Goel and Thakor's (2008) analytical model shows that a moderately overconfident risk-averse CEO increases firm value.

Since there is prior work that contends that CEO overconfidence is positive while other researchers contend that the overconfidence is detrimental, the intent of this study is to examine the consequences of CEO overconfidence in two different contexts. First, we examine the impact of CEO overconfidence on the cost of debt and the conditions under which the impact is most pronounced. Second, we examine the impact of SOX information disclosure-related penalties within the context of CEO selection.

Investigating the impact of CEO overconfidence on the cost of debt is important given the prevalence of overconfident CEOs (Ben-David et al. 2007; Larwood and Whittaker 1977; Weinstein 1980). Existing research on manager overconfidence mainly focuses on whether overconfident CEOs contribute to observed firm behavior beyond what traditional economic theory can explain. Given the documentation of potentially detrimental behavior, it is worthwhile to focus on the economic consequences of these firm behaviors induced by overconfident CEOs. A few studies have found evidence supporting the presence of manager-specific effects in firm policies (Bertrand and Schoar 2003), leverage choices (Frank and Goyal 2007), compensation levels (Graham et al. 2009), voluntary disclosure outcomes (Bamber et al. 2010), tax choices (Dyreng et al. 2010), and performance variability (Adams et al. 2005). There has been little empirical investigation of the economic consequences of CEO behavior biases in the bond market. In particular, the strategies investors employ to detect and incorporate managerial overconfidence when pricing bonds need elaboration and explanation. Sunder et al. (2009) find that bondholders design more restrictive covenants for firms with overconfident CEOs and find no evidence that the cost of debt is affected by CEO overconfidence.(Note 3) However, economic theory suggest that estimation risk will be priced (e.g., Barry and Brown 1984 and 1985) and that information quality is also priced by the markets (Easley and O'Hara 2004; Lambert et al. 2007) Evidence (Foerster et al. 2009) is consistent with the notion that information risk in terms of the disclosure quality and quantity of management forecasts is to some extent not diversifiable. Specifically, they document that issuance of more frequent, precise, and credible management forecasts are associated with lower risk, including bankruptcy risk.

Our motivation to examine the consequences of CEO overconfidence in the bond market rather than in the stock market is twofold. First, prior literature (i.e., Malmendier and Tate 2005) has found that overconfident managers avoid equity financing and rely on internal cash and debt to fund projects. A CEO is optimistic about the value of the firm's assets and investment opportunities. The CEO then balances two conflicting goals: the maximization of perceived fundamental value and the minimization of perceived cost of capital (Heaton 2002; Malmendier and Tate 2005). In particular, an overconfident manager believes there is never a good time to issue equity (Baker et al. 2007 pp. 169-170). In fact, managers may have incentives to reduce information asymmetry, possibly arising from investment opportunities, through voluntary disclosures of more earnings information (Ruland et al. 1990; Marquardt et al. 1998).

Second, any inferences from studies using current developed proxies for the cost of equity capital (Botosan and Plumlee 2005; Easton 2004; Easton and Monahan 2005) are subject to concerns regarding bias in the proxies and significant measurement error that may be driving the observed inferences. In contrast, measuring the cost of debt is relatively simple; the measurement error issue for the cost of debt is not as severe as that for the cost of equity. Therefore, we examine the consequences of CEO overconfidence in the debt market to bring new insights into the behavior economic and finance literature, although such focus may lead to a smaller sample size and less powerful tests.

Our study differs from that of Sunder et al. (2009), which was based on the presumption that overconfident CEOs may be willing to incur a higher cost of debt in order to avoid restrictive covenants. While Paredes (2005) points out that a CEO who exhibits self-confidence and commitment to a course of action can boost morale and motivate others in the firm to work hard, our analysis focuses on whether the bond market adjusts the cost of capital for the expected optimism of an overconfident management. Our sample period from 1996 to 2009 is much more recent than that employed by Sunder et al. (2009) (1980 to1995). In addition, we employ a measure of CEO confidence based on the degree of optimism in management (see Hribar and Yang 2007; Bamber et al. 2010). They provide evidence that overconfidence increases the optimistic bias in management forecasts. (Note 4) The advantage of our measure is that it measures CEO overconfidence from the quality of information perspective.

To address whether CEO overconfidence affects the cost of debt, we stratify our observations based upon optimism in the management forecast. We use bond yield spreads (Mansi et al. 2004; Sengupta 1998; Shi 2003) as a proxy for a firm's cost of debt. (Note 5) For our analysis, we regress excess yield on a CEO overconfidence indicator, controlling for other factors. A finding that firms with optimistic management forecasts have higher bond yield spreads is consistent with the notion that the market is efficient and discounts the optimism. To the contrary, a finding that bond yield spreads are lower for firms with overconfident CEOs (optimism in the forecasts) would indicate that the market is deceived by the overconfidence or rewards overconfidence.

Investors can use a subsequent audited earnings report and information from other sources to assess management forecast bias and CEO behavior. We hypothesize that, after gaining information about CEO overconfidence through patterns of optimistic bias in their management earnings forecasts, the market requires a higher premium on the cost of debt to compensate for the risk that management is overconfident and overly optimistic. To test whether the revelation of CEO overconfidence exacerbates its impact on the cost of debt, we partition our sample into two subsamples based on a pattern of overconfidence in forecasts over time: one with revealed CEO overconfidence and another without it. We run the bond yield regression on the CEO overconfidence indicator in the two subsamples.

The second context in which we examine the impact of CEO overconfidence focuses on CEO choice. Since the CEO and other management executives impact the information-disclosure culture of the firm, we investigate the degree to which the board of directors choice of CEO is impacted by information disclosure-related penalties that might be associated with CEO overconfidence. This is important for understanding whether the firm's board of directors also realizes the potential impact that choosing an overly optimistic or overconfident CEO may have on the company via SOX's information disclosure-related penalties. Moreover, the potential market disciplining effect on CEO overconfidence, such as a sharp stock price decrease, makes it interesting to examine the regulation effect on the CEO selection process.

Prior research indicates that CEO overconfidence is a product of corporate governance (Paredes 2005), and an overconfident manager is more likely to be promoted to CEO than is a rational manager under value-maximizing corporate governance (Goel and Thakor 2008). (Note 6) One of Goel and Thakor's (2008) empirical predictions stemming from their model is that SOX leads to a lower incidence of overconfidence among CEOs. (Note 7) To test their prediction, we estimate a logistic regression where the dependent variable is the CEO overconfidence indicator and one of the independent variables is a regulation indicator, *SOX*, controlling for firm size, corporate governance, and board characteristics variables, etc. Our study differs from Feng et al. (2009), who examine the relation between internal control qualities and the forecast accuracy in that their sample period only spans three years beginning 2004, post-SOX, for firms with internal control reports. Although it is possible that after SOX managers would meet their forecasts more often due to the improvement of internal control, we still cannot rule out the possibility that the impact of SOX on the CEO overconfidence level results in less biased earnings forecasts as evidenced in Bamber et al. (2010).(Note 8)

The three important inferences from our analyses are the following. First, we find that firms with overconfident CEOs have a higher cost of debt. The evidence supports the notion that the market discerns and discounts overconfidence resulting in investment inefficiency. Second, we find that the revelation of CEO overconfidence exacerbates the market's discount on overconfidence. This finding supports the argument that investors discount overconfidence based on past information about CEO overconfidence. Finally, we document that CEOs are less likely to be overconfident after the passage of SOX. This finding is consistent with Goel and Thakor's (2008) prediction, thus supporting the conjecture that the stiff penalties in SOX affects the board's preference in selecting CEOs, and thereby the level of overconfidence. Our findings are consistent with Banerjee et al.'s (2015) argument that an independent board mitigates the costs of CEO overconfidence in terms of investment and risk exposure.

This study contributes to the current literature on CEO behavior bias, voluntary disclosure, market efficiency, and the consequences of SOX. First, it provides evidence that CEO personal attributes and behavioral biases, such as overconfidence, have economic consequences in terms of the cost of debt. In other words, our evidence suggests that CEO overconfidence is an important factor in bond pricing. Second, we provide evidence that there is an association between management forecast patterns and bond pricing, suggesting that investors take into account the management forecast patterns over time when pricing CEO overconfidence. Finally, this study extends the literature on the consequences of SOX by testing Goel and Thakor's (2008) prediction that SOX has resulted in a lower incidence of CEO overconfidence. In fact, our study is the first empirical study to explore the determinants of CEO behavior and to examine the impact of SOX on the CEO selection process.

2. Research Questions and Hypotheses Development

This study examines two research questions.

> (1) Does CEO overconfidence have an impact on bond pricing? If so, does the revelation of CEO overconfidence to investors exacerbate the impact of CEO overconfidence on the cost of debt?

> (2) Does empirical evidence pertaining to board decisions to select CEOs and/or to retain incumbent CEOs conform to the prediction that, due to information disclosure related penalties, the board prefers a less overconfident CEO post-SOX?

2.1 CEO Overconfidence and the Cost of Debt

We examine the association between CEO overconfidence and the cost of debt. Examining this association is motivated by several studies' findings: firms with overconfident CEOs rely on internal cash and debt to fund projects (Malmendier and Tate 2005; Malmendier et al. 2005). How is executive overconfidence associated with the cost of debt? Firms with overconfident CEOs may have a higher cost of debt. First, corporate finance literature provides evidence that overconfident CEOs make value-destroying investment decisions. For example, Overconfident CEOs tend to overestimate their ability to generate returns, to overpay for target companies, and to engage in potentially value-destroying mergers. As a result of CEO overconfidence, firms are led to invest in projects that do not maximize firm value. Furthermore, it is unlikely that CEOs learn from their own mistakes and from others' mistakes at other firms to remedy their overconfidence.

CEOs most likely blame other factors, such as economic downturns for a bad outcome of an investment rather than take responsibility for their actions. Even if a CEO attributes the failure of an investment to her/his overconfidence, her/his actual behavior still may not change because of reputation concerns. Second, lenders may perceive higher information risk for firms with an overconfident CEO. Schrand and Zechman (2008) provide evidence that executive confidence is one of the determinants of fraud. Bamber et al. (2010) show that top manager style affects the quality of management forecasts employing specific effects design. When contemplating lending, in particular long-term lending, lenders perform a credit analysis along several directions: capital structure, collateral, coverage, capacity, and character of top management (Tirole 2006 p. 82). Accordingly, if executive overconfidence increases the likelihood of financial reporting fraud and low disclosure quality, lenders may perceive the reporting quality of earnings and other accounting information for firms with overconfident CEOs on average as being of lower quality than the reporting quality for firms without overconfident CEOs. More importantly, economic theories suggest that pricing of estimation risk argument (e.g., Barry and Brown 1984 and 1985) and pricing of information quality in the absence of estimation risk argument (Easley and O'Hara 2004; Lambert et al. 2007) support the association between information quality/risk and the cost of capital.

Taken together, the negative effects of CEO overconfidence on financial decisions and financial reporting are likely to lower a firm's value and bondholders' interest in a long run. Bondholders perceive that firms with overconfident CEOs have greater information risk and as a result are more likely to charge these firms a higher cost of debt. Accordingly, we hypothesize that an efficient market discounts CEO overconfidence and charges a higher cost of debt for firms with overconfident CEOs than for firms with rational CEOs (the market efficiency hypothesis). (Note 9)

On the other hand, firms with overconfident CEOs may enjoy a lower cost of debt. Some studies (e.g., Bénabou and Tirole 2002; Brunnermeier and Parker 2005; Compte and Postlewaite 2004; Gervais and Goldstein 2007; Gervais et al. 2007) argue that overconfidence is an optimal endogenous behavior choice by individuals in a corporate setting. In addition, Goel and Thakor's (2008) analytic model suggests that the effect of CEO overconfidence on firm values is non-monotonic; that is, a risk averse CEO's overconfidence enhances firm value because the overinvestment problem of overconfidence offsets the underinvestment of risk aversion. (Note 10) In a different vein, Galasso and Simcoe (2009) provide empirical evidence that firms with overconfident CEOs are more innovative than firms with rational CEOs. Accordingly, firm value may be enhanced by an overconfident management. Indeed, it is important for firms to remain innovative given the competitive global market and the rapid rate of technological change. Finally, confidence may be a signal to competitors about competence and commitment and thus help to build a CEO's favorable reputation. Therefore, although overconfidence has negative effects on financial decisions, it may benefit firms' performances overall and thus lower the cost of debt (the optimal choice hypothesis). Our first hypothesis (in alternative form) is:

H_{1a}: CEO overconfidence increases the cost of debt on average (Market Efficiency Hypothesis);

H_{1b}: CEO overconfidence lowers the cost of debt on average (Optimal Choice Hypothesis).

A finding that firms with overconfident CEOs have a higher cost of debt would provide evidence consistent with the market efficiency hypothesis. A finding that firms with overconfident CEOs have a lower cost of debt would provide evidence consistent with the optimal choice hypothesis. Such evidence would also be consistent with the notion that the market is deceived by CEO behavior or rewards overconfidence.

After gaining information about CEO overconfidence, would the market take this information into account when pricing bonds? In other words, we consider that investors discount CEO overconfidence conditionally based on past information about CEO overconfidence. Investors can use a subsequent audited earnings report and information from other sources to assess management forecast bias and CEO behavior. (Note 11) Assuming the market efficiency

hypothesis holds, once CEOs reveal themselves as overconfident, the market may discount overconfidence more for these firms and require more premiums in terms of the cost of debt. Our second hypothesis (in alternative form) is:

> H_2: The effect of CEO overconfidence on the cost of debt is more pronounced for firms with a pattern of optimistic forecasts over time.

A finding that firms with a pattern of optimistic forecasts over time have a higher cost of debt than firms without the pattern would suggest that investors are able to assess the level of CEO confidence based on management forecasts, annual reports, and information from other sources and offer less favorable terms to these firms. A finding that firms with a pattern of optimistic forecasts over time or firms without overconfidence have the same cost of debt would suggest either investors' inability to assess the level of CEO confidence or investors' neglect of past information.

2.2 CEO Overconfidence and SOX

Given the prevalence of CEOs' overconfidence and its potential economic consequences as addressed, it is appropriate to examine whether the SOX regulation has impacted the corporate board's choice of CEO and, accordingly, the level of CEO confidence. Prior literature shows that managers face a number of penalties for voluntarily disclosing inaccurate earnings information. The penalties include loss of reputation, probability of legal actions, and negative capital market consequences. However, the empirical evidence concerning the effectiveness of these penalties in deterring managers from issuing biased forecasts is mixed. While some studies (e.g., McNichols 1989) find that these penalties are sufficient, other studies (Chen 2004; Kasznik 1999; Trueman 1986) find that firms fail to meet their own earnings forecasts.

SOX imposes stiff penalties on firms and managers for providing inaccurate information. Goel and Thakor (2008) argue that such penalties for misrepresentation of information may cause the board to shift its preference away from an overconfident manager or CEO. Although an overconfident CEO attenuates the risk aversion-induced underinvestment inefficiencies associated with a rational CEO, s/he may under-invest in information precision. Post-SOX, since the cost of underinvestment in information precision is very high, the board may prefer to appoint a more rational CEO rather than an overconfident CEO.

In Goel and Thakor's model, the sequence of events begins at the point in time $t = -1$ when the board decides who to appoint as CEO at time $t = 0$. There are two groups of managers: A and B, such that managers in A are more likely to be overconfident than managers in B. At time $t = 0$, the CEO chooses the risk of his/her project based his/her preliminary information and chooses the precision of the information about the project prospects available to the board and investors by making an unobservable investment in information production. At time $t = 1$, project payoffs are observed, the CEO is compensated based on the project payoffs, and the board decides to retain/fire the incumbent CEO.

Corollary 2 in their model suggests that in the absence of information disclosure penalties, the board would prefer a moderately overconfident CEO from group A because an overconfident CEO attenuates the risk aversion-induced underinvestment inefficiencies. (Note 12) Although the overconfident CEO under-invests in information precision and thus provides imprecise information about the project prospects to investors, the cost of underinvestment in information precision is minimal. However, stiff penalties for imprecise information produced by an overconfident CEO may motivate the board to change its preference and choose a rational CEO from group B. Accordingly, Goel and Thakor (2008) predict that SOX affects the board's CEO selection process in favor of less confident CEOs. Consistent with Goel and Thakor's (2008) prediction, our third hypothesis (in alternative form) is

> H_3: CEOs are less likely to be overconfident post-SOX.

We are able to test this hypothesis because of sufficient CEO turnover since the passage of SOX. In other words, the post-SOX sample of CEOs and the pre-SOX sample of CEOs potentially are different. A finding that CEOs are less likely to be overconfident post-SOX would support the prediction that SOX leads to a lower incidence of CEO overconfidence and thus support the role of corporate governance in CEO selection. Alternatively, Paredes (2005) argues that CEOs can become overconfident as a result of a CEO-centric model of corporate governance and large compensation packages in the United States. In particular, boards, subordinate officers, and shareholders defer to a CEO, even post-SOX. Therefore, it is possible that the level of CEO overconfidence will be not reduced even though less overconfident CEOs are selected in the first place in the post SOX era.

Besides regulations, market pressures may constrain managerial overconfidence. Market pressures include product market competition, an active market for corporate control, or an active market for management, etc. (Note 13) In other words, excessively overconfident CEOs might be removed or the business might be acquired. However, the extent to which markets can constrain overconfidence is limited, as indicated in Paredes (2005). For example, boards of directors can adopt defensive strategies, making takeover impossible.

3. Research Design

3.1 CEO Overconfidence and the Cost of Debt

The impact of CEO overconfidence on the cost of debt is examined using the following regression:

$$Spread_{i,t+1}=\beta_0 + \beta_1 Overcon_{it} + \sum\gamma Controls_{it} + \upsilon_{it} \tag{1}$$

Where $Spread_{i,t+1}$: the yield to maturity at the issuance date issued in year $t+1$, minus the Treasury bond yield with similar maturity calculated as the natural logarithm because of the skewness of the yield spreads.

$Spread_{i,t+1}$ serves as a proxy for the cost of debt. We report the results using the bond with the largest offering amount issued after earnings announcements for year t. The tenor of our results is not affected when we use the weighted average bond yield spread. $Overcon_{it}$ is an indicator of CEO overconfidence and the explanatory variable of interest. This variable and the control variables are discussed below. We calculate two way cluster-robust standard errors (Petersen 2009; Gow et al. 2010).

3.1.1 Measurement of CEO Overconfidence

Following Schrand and Zechman (2012), we refer to the behavioral bias of having unrealistic (positive) beliefs about *any* aspect of the distribution of an uncertain outcome as overconfidence. Although a few recent studies related to executive overconfidence use the length of time a CEO holds options to measure overconfidence, we use an indicator based on optimistic management earnings forecasts (MEF) to serve as a proxy for CEO overconfidence.

Since managers issue forecasts in different forms (e.g., point, range, and open-ended), we classify firms into the overconfident group and the rational group as follows. (Notes 14&15) $Overcon_{it}$ is an indicator variable that is equal to one if a manager misses his own earnings forecast for the fiscal year and otherwise is zero. (Note 16) For point estimates, the forecast is coded as $Overcon_{it} = 1$ if the actual EPS is less than the estimated EPS and as zero otherwise. For range and open-ended estimates, the forecast is coded as $Overcon_{it} =1$ if the actual EPS is less than the lower bound and as zero otherwise. Forecasts must be issued at least 30 days prior to the end of the fiscal year. If multiple forecasts are issued in the same fiscal year, we include only the last forecast issued at least 30 days prior to the end of the fiscal year.

Furthermore, we employ a continuous variable, $Overcon\_continue_{it,}$ to measure CEO overconfidence. We define $Overcon\_continue_{it}$ as the difference between the management earnings forecast and actual EPS for point earnings forecasts and as the difference between the midpoint of the forecast range and actual EPS for range earnings forecasts. A higher value of $Overcon\_continue_{it}$ suggests a higher level of CEO overconfidence.

The motivation to use optimistic management earnings forecasts to measure CEO overconfidence is the linkage between CEO overconfidence and the quality of the information available to investors. Goel and Thakor (2008) argue that, "An overconfident CEO desires the same precision as the rational CEO, but believes her original signal to be more precise and so believes the desired precision is attainable with a lower investment in information." Indeed, they conclude that overconfident CEOs produce less precise information than do rational CEOs. In this context, overconfident CEOs overestimate their ability to affect financial results, and they are excessively optimistic about future firm performance. As a result, they issue upwardly-biased earnings forecasts. In addition, Hribar and Yang's (2007) empirical findings suggest that CEO overconfidence (proxied by a news-based measure) is associated with an increased likelihood of missing management forecasts. Bamber et al. (2010) provide evidence that individual managers play a significant role in their firms' earnings forecast properties including bias. Therefore, one main advantage of our approach is that we measure CEO overconfidence from the quality of the information perspective. We expect the coefficient estimate on $Overcon_{it}$ and $Overcon\_continue_{it}$ to be positive (negative) if the market efficiency hypothesis (optimal choice hypothesis) holds.

One potential limitations of using optimistic management earnings forecasts to measure CEO overconfidence: management forecasts are potentially endogenous. There is endogeneity in the choice to forecast, choice of timing of forecast, choice of precision of the forecast, and choice of bias in the forecast. It is challenging to actually control for endogeneity. Therefore, in the sensitivity test, we use alternative measures, such as late option exercise indicators, to determine if our results are robust.

3.1.2 Control Variables

The control variables included were based on the findings of prior literature regarding the determinants of corporate bond yield spreads (Ashbaugh-Skaife et al. 2006; Campbell and Taksler 2003; Fisher 1959; Khurana and Raman 2003; Mansi et al. 2004; Sengupta 1998; Shi 2003; Ziebart and Reiter 1992). We include variables for issuer characteristics, issue characteristics, market conditions, information environment, and audit quality in the regression (1). We do not

include a variable for call provision since none of our sample observations contains a call provision. Definitions for our control variables are provided below.

Issuer Characteristics

EPS_{it} = earnings per share before extraordinary items in current fiscal year divided by its stock price at the end of the previour year;

$Loss_{it}$ = 1 if earnings before extraordinary items < 0; otherwise, 0;

$LTlev_{it}$ = long-term debt divided by total assets at the end of the current year ;

$Coverage_{it}$ = operating income before depreciation divided by interest expense,

Cap_inten_{it} = gross PPE divided by total assets;

$StdRoa_{it}$ = firm i's standard deviation of ROA calculated using five years data (with a minimum of three years of available data) from year $t-4$ to t.

ROA is net income before extraordinary items scaled by total assets at the beginning year;

$StdRet_{it}$ = the standard deviation of daily excess stock returns over the market portfolio during the year (255 trading days);

BM_{it} = the natural log of book value of equity divided by its market value of equity, both measured at the end of the year;

$Size_{it}$ = the natural logarithm of total assets at the end of year t;

Issue Characteristics

$Rating_{it}$ = S&P credit ratings. Rratings letters are coded with a smaller number indicating a better rating (e.g., AAA = 1, AA+ = 2);

$Senior_{it}$ = 1 for senior bonds and 0 for subordinated bonds;

$IssueSize_{it}$ = the natural log of the offering amount of the bond (in millions of dollars).

Market Conditions

BC_{it} = the difference between the average yield on Moody's Aaa bonds and the average yield of ten-year U.S. Treasury bonds for the issue month.

Information Environment

$Num\_Analyst_{it}$: the log of analyst coverage in two ways.

Audit Quality

$Auditor_{it}$ = 1 if big N firm; otherwise, 0.

The expected signs for these variables are presented in Table 4. We winsorize EPS_{it}, $LTlev_{it}$, $Coverage_{it}$, Cap_inten_{it} , BM_{it}, and $Size_{it}$ at the top and bottom one percent level to mitigate the influence of outliers. Overall, we examine the association between CEO overconfidence and credit spreads (H$_1$) by estimating regression (1). To test H$_2$, we partition the sample into two subsamples (one with revealed CEO overconfidence and another without it) and then estimate regression (1) for the two subsamples separately. Our classification of revealed CEO overconfidence is based on whether managers issued any optimistic earnings forecasts in the past two years (i.e., years $t-1$ and $t-2$). We inspect CEOs data for the three-year period and exclude observations with CEO turnover within the three-year period to avoid mis-grouping the revelation of prior CEO's confidence level with an incoming CEO. We expect the coefficient estimate on the overconfidence indicator for the revealed CEO overconfidence group to be greater than that for the unrevealed CEO overconfidence group.

3.2 CEO Overconfidence and SOX

To test H$_3$, we estimate a logistic regression for a sample of firms issuing annual management earnings forecasts. (Note 17) We assume that the marginal probability of overconfidence over the next period follows a logistic distribution and is given by

$$P(Overcon_{it} = 1) = \frac{1}{1 + \exp(-\alpha - \beta x_{it})} \quad , \tag{2}$$

Where $Overcon_{it}$ is defined the same as before, and x_{it} is a vector of explanatory variables.

We estimate a logistic regression with the explanatory variables: SOX_{it}, $Size_{it}$, $BoardInd_{it}$, $BoardSize_{it}$, and $Gindex_{it}$. SOX_{it} is equal to one if 2002 or after; zero otherwise. $BoardInd_{it}$ is the percentage of outside directors, and $BoardSize_{it}$ is the total number of directors. $Gindex_{it}$ is Gompers-Ishi-Metrick index to proxy for the level of shareholder rights (Gompers et al. 2003). Industry fixed effect is included because CEOs in firms in riskier industries may be more likely to be overconfident. The explanatory variable of interest is SOX_{it}. Based on Goel and Thakor's (2008) prediction, we expect the estimate of coefficient on SOX_{it} to be negative. In essence, we test whether over-confidence changes post-SOX after controlling for other factors expected to affect over-confidence. Furthermore, based on prior research (e.g., Ajinkya et al. 2005; Armstrong et al. 2007), we selected additional independent variables to control for other possible determinants of management earnings forecast bias. In other words, we control for other factors potentially driving optimistic earnings forecasts to attenuate the limitation of our overconfidence measure. Such factors include the number of analysts following a firm ($Num\_Analyst_{it}$), management forecast horizon ($Horizon_{it}$), an indicator ($Loss_{it}$) to indicate whether the firm is profitable in year t. Lang and Lundholm (1993, 1996) have documented a positive relationship between corporate disclosure quality and the number of analysts following a firm. We employ $Horizon_{it}$, the number of days between the forecast date and the fiscal year-end date to proxy for earnings uncertainty and the unobservable precision of managers' beliefs (Baginski and Hassell 1997). Similar to analysts, managers may also have greater problems in forecasting earnings for unprofitable firms.

Borokhovich et al. (1996) document the impact of the percentage of outside directors on the CEO selection. In particular, the likelihood that an executive from outside the firm is appointed CEO increases with the percentage of outside directors. Their findings are consistent with the director incentives argument. In contrast, the potential impact of the percentage of outside directors on the level of CEOs overconfidence is not straightforward. Paredes (2005) discusses several reasons that outside directors cannot effectively monitor CEO performance. For example, being an outside director is a part time job. As a result, it is possible that outside directors lack sufficient time to consider fully the information provided by their CEOs. In addition, an outside director may give the benefit of doubt to the CEO who appointed him on the board. Overall, the role of outside directors in selecting a strong CEO may not be significant. Shareholders' role in selecting CEOs seems limited. We do not make any predictions for the relationship between firm size or board size and the level of CEO overconfidence.

4. Sample and Descriptive Statistics

Our empirical tests employ data from four sources:

1) Management earnings forecasts and actual earnings – First Call database

2) Bond ratings and bond yield spread data – the Mergent Fixed Income Security Database (FISD)

3) Financial statement data – the COMPUSTAT annual database

4) Corporate governance data – the RiskMetrics database.

4.1 CEO Overconfidence and the Cost of Debt

The sample selection process includes two steps. First, we exclude qualitative forecasts from the Company Issued Guidance (CIG) file in First Call database and then combine annual management earnings forecasts data with the Issue file and Rating file in Mergent FISD. We exclude financial institutions (SIC code 6000-6999) and utility firms (SIC code 4000-4999) because the debt financing activities of these firms are significantly different from those of firms in other industries. To be included in our sample, management earnings forecasts must be issued at least 30 days prior to the end of the fiscal period to ensure that there is uncertainty in the actual earnings. This yields a potential sample of 708 issuers with management earnings forecasts for the 14-year period beginning in 1996 and ending in 2009. Second, we combine the initial sample with the COMPUSTAT annual file to obtain data for our control variables in the bond yield spread regression. Our final sample consists of 265 issues: 82 issues with overconfident CEOs (the overconfident group) and 183 issues without overconfident CEOs (the rational group) based on whether managers issued any optimistic annual earnings forecasts in year t. We then partition this sample into two subsamples based on whether managers issued any optimistic annual earnings forecasts in the past two years such that a firm issuing an optimistic forecast in either of the past two years is classified as having an overconfident CEO; this results in 127 issues with overconfident CEOs (the history group) and 138 issues without overconfident CEOs (the control group). Our focus on annual earnings forecasts and realizations is warranted by the realizations of annual earnings being audited. Overall, our sample includes 169 firms out of which 114 were with one issue of debt and one firm was with the largest number of issues of debt, six.

Panel A of Table 1 presents the summary statistics for the key variables in regression (1). The mean (median) bond yield spread is 5.053 (4.962) in the aggregate sample. The panel also reveals that the sample consists primarily of

investment grade firms with a median rating of BBB+, that 91.3% of these firms issued senior bonds, and that 98.4% of these firms were audited by one of the big four audit firms, and that firms have 12 analysts following the stock on average. Panel B of Table 1 shows the mean (median) bond spreads for the overconfident group and the rational group, as 5.254(5.254) and 4.963 (4.852) respectively. The mean (median) bond yield spread is significantly greater for the overconfident group (244.4 basis points) than for the rational group (181.8 basis points) at the one percent level (two-tailed t test and Wilcoxon test).

Table 1. CEO Overconfidence and Cost of Debt: Summary Statistics

Panel A Summary Statistics

Variable	25th Pctl	Mean	Median	75th Pctl	Std Dev
$Spread_{i,t+1}$	4.532	5.053	4.962	5.686	0.738
$Overcon_{it}$	0.000	0.309	0.000	1.000	0.463
$Rating_{it}$	6.000	7.871	8.000	9.000	3.309
$Size_{it}$	8.109	8.901	8.865	9.859	1.083
$Loss_{it}$	0.000	0.060	0.000	0.000	0.238
EPS_{it}	0.037	0.055	0.055	0.071	0.054
$LTlev_{it}$	0.127	0.231	0.219	0.312	0.127
$Coverage_{it}$	5.947	15.894	9.742	17.640	21.114
Cap_inten_{it}	0.327	0.573	0.513	0.791	0.334
$StdRoa_{it}$	0.012	0.028	0.020	0.032	0.028
$StdRet_{it}$	0.014	0.019	0.017	0.023	0.007
BM_{it}	-1.441	-0.994	-0.888	-0.511	0.763
$Senior_{it}$	1.000	0.913	1.000	1.000	0.282
$IssueSize_{it}$	12.429	12.865	12.765	13.122	0.746
BC_{it}	1.320	1.579	1.530	1.870	0.506
$Auditor_{it}$	1.000	0.984	1.000	1.000	0.122
$Num\_Analyst_{it}$		2.397	2.484	2.772	0.576

Panel B Bond yield spread and CEO overconfidence

$Overcon_{it}$	N	25th Pctl	Mean	Median	75th Pctl	Std Dev	T-stats	Wilcoxon Test
0	183	4.471	4.963	4.852	5.570	0.731	3.02***	12,529.50 ***
1	82	4.634	5.254	5.254	5.897	0.719		

***, **, and * indicate significance at the one percent, five percent, and one percent respectively (two-tailed test).

The Pearson (Spearman) correlation (untabulated) between $Spread_{i,t+1}$ and $Overcon_{it}$ is 0.183 (0.173), significant at the one percent level. This significantly positive correlation between the CEO overconfidence indicator and bond yield spreads provides initial support for H_{1a} (our market efficient hypothesis) that bondholders discount CEO overconfidence because CEO overconfidence impairs financial decisions. Correlations indicate that most control variables are significantly correlated with $Spread_{i,t+1}$ with the expected signs.

Panel A of Table 2 shows the industry distribution of two subsamples. While the percentages of observations with overconfident CEOs in Extractive and Retail are significantly higher than are those in the control sample in the same industries, the percentages of observations with overconfident CEOs in Food, Mining and Construction, and Computers are about three percent lower than are those in the control sample in the same industries. Overall, the distribution of observations across industries is similar for the overconfidence group and the rational group. Panel B of Table 2 presents the year distribution of our sample. The number of observations is the largest in 2008 (53 issues, 20% of our sample) while the number of issues is the smallest in 2009 (5 issues, 1.89% of our sample).

Table 2. Industry and year distribution

Panel A Industry distribution

Industry	No. of Obs. with Overconfident CEOs	Percentage of Obs. with Overconfident CEOs	No. of Obs. without Overconfident CEOs	Percentage of Obs. without Overconfident CEOs
Agriculture	0	0.00	1	0.55
Automotive	0	0.00	0	0.00
Chemicals	7	8.54	13	7.10
Computers	2	2.44	10	5.46
Durable Manufacturers	21	25.61	46	25.14
Extractive	5	6.10	2	1.09
Food	7	8.54	21	11.48
Mining and Construction	2	2.44	9	4.92
Miscellaneous	1	1.22	1	0.55
Pharmaceuticals	2	2.44	21	11.48
Retail	15	18.29	19	10.38
Services	7	8.54	8	4.37
Textiles and Printing/Publishing	7	8.54	16	8.74
Transportation	6	7.32	16	8.74
Total	82	100%	183	100%

Panel B Year distribution

Year	No. of Obs.	Percentage of Obs.
1996	9	3.40
1997	7	2.64
1998	14	5.28
1999	7	2.64
2000	6	2.26
2001	30	11.32
2002	31	11.70
2003	32	12.08
2004	16	6.04
2005	17	6.42
2006	13	4.91
2007	25	9.43
2008	53	20.00
2009	5	1.89
Total	265	100%

4.2 CEO Overconfidence and SOX

To examine the regulation effect on the level of CEO overconfidence, we use a sample of firms issuing management earnings forecasts for the 11-year period beginning in 1996 and ending in 2006. We merge the CIG file in First Call with the corporate governance and director data in Riskmetrics. We exclude financial institutions and utilities firms. The sample with necessary board characteristics, corporate governance data, and other control variable data to estimate the logistic regression is 1,646 firm-year observations: 511 in the pre-SOX period and 1,135 in the post-SOX period. This sample size is much larger than that for examining the impact of CEO overconfidence on the cost of debt because here we look at all firms whether or not they issued debt during our sample period.

5. Results

5.1 Effects of CEO Overconfidence on the Cost of Debt

The test of H_1 was conducted by using regression to control for other factors expected to impact cost of debt, with the results summarized in Table 3. Variance inflation factors (VIF) were also estimated. The highest VIF on the explanatory variables is 3.18, suggesting that multi-collinearity is not a great concern. The Breusch and Pagan (1979) test for heteroscedasticity yields a χ^2 of 60.95, indicating that heteroscedasticity could be problematic. Therefore, the reported two-way clustered standard errors are based on White's (1980) heteroscedasticity–corrected covariance matrix.

Panel A shows that the coefficient estimate on $Overcon_{it}$, 0.058, is positive and statistically significant at the ten percent level (two-tailed test). The control variables generally have their expected signs. In particular, the coefficient estimates for $Rating_{it}$, BM_{it}, and BC_{it} are positive and significant. The adjusted R^2 for the regression is 0.638. Panel B shows that the coefficient estimate on $Overcon\_continue_{it}$, 0.076, is positive and statistically significant at the five percent level. Considering the potential nonlinear relationship between the level of CEO overconfidence and the cost of debt, we create a variable as the square of $Overcon\_continue_{it}$, and add it to the regression (1). The untabulated results suggest no significant relationship between this variable and the bond yield spreads. Taken together, these results are consistent with the market efficiency hypothesis: the market is efficient and it discounts CEO overconfidence when pricing bonds. These results are also consistent with Sengupta's (1998) finding: firms with high disclosure quality enjoy a lower cost of debt.

Table 3. OLS regression of the bond yield spread on CEO overconfidence

Panel A OLS regression of the bond yield spread on the CEO overconfidence indicator

Variable	Predicted sign	Coefficient	Clustered Standard Error	T-stats
$Overcon_{it}$	+	0.058*	0.035	1.63
$Rating_{it}$	+	0.131***	0.011	11.12
$Size_{it}$	−	0.046	0.076	0.60
$Loss_{it}$	+	0.230	0.154	1.48
EPS_{it}	−	0.576	0.836	0.68
$LTlev_{it}$	+	-0.048	0.212	-0.22
$Coverage_{it}$	−	0.001	0.001	1.07
Cap_inten_{it}	−	-0.057	0.104	-0.55
$StdROA_{it}$	+	1.072	0.898	1.19
$StdRET_{it}$	+	-1.024	7.200	-0.14
BM_{it}	+	0.115***	0.041	2.78
$Senior_{it}$	−	-0.073	0.103	-0.71
$IssueSize_{it}$	?	-0.111	0.216	-0.51
BC_{it}	+	0.720***	0.157	4.56
$Auditor_{it}$	−	0.135	0.138	0.97
$Num\_Analyst_{it}$	−	-0.057	0.060	-0.96
$Intercept$	?	4.039**	2.092	1.93
obs. #		265		
Adjusted R^2		0.638		

Panel B OLS regression of the bond yield spread on the CEO overconfidence continuous variable

Variable	Predicted sign	Coefficient	Clustered Standard Error	T-stats
$Overcon\_continue_{it}$	+	0.076**	0.036	2.11
$Rating_{it}$	+	0.129***	0.014	8.94
$Size_{it}$	−	0.040	0.081	0.50
$Loss_{it}$	+	0.220	0.135	1.62
EPS_{it}	−	0.751	0.834	0.90
$LTlev_{it}$	+	-0.206	0.226	-0.91
$Coverage_{it}$	−	0.001	0.001	0.66
Cap_inten_{it}	−	-0.016	0.111	-0.14
$StdROA_{it}$	+	2.222	1.610	1.37
$StdRET_{it}$	+	-1.844	7.425	-0.24
BM_{it}	+	0.104**	0.042	2.46
$Senior_{it}$	−	-0.110	0.109	-1.00
$IssueSize_{it}$	?	-0.138	0.229	-0.60
BC_{it}	+	0.766***	0.158	4.82
$Auditor_{it}$	−	0.142	0.118	1.20
$Num\_Analyst_{it}$	−	-0.033	0.065	-0.50
Intercept	?	4.346	2.213	1.96
obs. #		243		
Adjusted R^2		0.661		

***, **, * indicate significance at the 0.01, 0.05 and .010 level or better, respectively. Two-tailed p value is reported.

5.2 CEO Overconfidence, Overconfidence History and the Cost of Debt

Table 4 presents the results of estimating regression (1) in two subsamples: one with any optimistic management earnings forecasts in the past two years (the overconfidence history sample) and another without any (the without history sample). The coefficient estimate on $Overcon_{it}$, 0.110, is still positive and statistically significant at the ten percent level for the history sample, while the coefficient estimate on $Overcon_{it}$, -0.032, for the sample without an overconfidence history is no longer significant. These results support H_2: after CEOs reveal their confidence type to the market, the market incorporates the past information about CEO overconfidence into bond pricing and requires a higher premium for issuers with a pattern of overconfidence in their earnings forecasts. In the sensitivity test, we use alternative measures for CEO overconfidence, such as late option exercise indicators (Malmendier and Tate 2008), in our analysis. Our inferences remain robust to these alternative measures.

Table 4. OLS regression of the bond yield spread on the CEO overconfidence history indicator

Variable	Predicted sign	History Coefficient	No History Coefficient
$Overcon_{it}$	+	0.110*	-0.032
$Rating_{it}$	+	0.146***	0.119***
$Size_{it}$	−	-0.073	0.077
$Loss_{it}$	+	0.117	0.504***
EPS_{it}	−	0.598	1.227
$LTlev_{it}$	+	0.086	-0.571
$Coverage_{it}$	−	0.003	-0.000
Cap_inten_{it}	−	-0.061	-0.008
$StdROA_{it}$	−	0.723	2.147
$StdRET_{it}$	−	5.109	-4.558
BM_{it}	+	0.078**	0.157**
$Senior_{it}$	−	-0.084	-0.049
$IssueSize_{it}$	?	0.281***	-0.274
BC_{it}	+	0.657***	0.732***
$Auditor_{it}$	−	0.347***	-0.174
$Num\_Analyst_{it}$	−	-0.150*	-0.000
Intercept	?	-0.112	6.255
obs. #		127	138
Adjusted R^2		0.717	0.630

***, **, * indicate significance at the 0.01, 0.05 and .010 level or better, respectively. Two-tailed p value is reported.

5.3 CEO Overconfidence and SOX

Panel A of Table 5 shows the summary statistics of key variables in the logistic regression (2). The mean (median) percentage of outside directors is 69.1 (71.4) percent, and the mean (median) board size is 9.25 (9.00) directors. The mean (median) governance index is 9.65 (10.00). 8% of observations are profitable. On average, managers forecast annual earnings within 126 days and firms have nine analysts following their stock. Panel B of Table 5 presents the year distribution. The number of observations is the largest in 2005 (310 firm-year observations, 19% of our sample).

Table 5. SOX and CEO overconfidence: summary statistics and year distribution

Panel A Summary Statistics

Variable	25th Pctl	Mean	Median	75th Pctl	Std Dev
$Overcon_{it}$	0.000	0.312	0.000	1.000	0.463
SOX_{it}	0.000	0.689	1.000	1.000	0.462
$Size_{it}$	6.886	7.912	7.860	8.839	1.370
$BoardInd_{it}$	0.583	0.691	0.714	0.833	0.168
$BoardSize_{it}$	7.000	9.258	9.000	11.000	2.520
$Gindex_{it}$	8.000	9.651	10.000	11.000	2.505
$Horizon_{it}$	66.000	125.585	76.000	163.000	85.861
$Loss_{it}$	0.000	0.080	0.000	0.000	0.272
$Num\_Analyst_{it}$	1.791	2.252	2.302	2.708	0.664

Panel B Year Distribution

Year	No of obs.	Percentage of obs.
1996	48	2.92
1997	12	0.73
1998	111	6.74
1999	105	6.38
2000	37	2.25
2001	198	12.03
2002	234	14.22
2003	263	15.98
2004	300	18.23
2005	310	18.83
2006	28	1.70
Total	1,646	100%

Table 6 presents the results of the effects of SOX on the level of CEO overconfidence. Columns (3) and (4) present the results for estimating the logistic model only including *SOX* and corporate governance variables. The estimated coefficient on SOX_{it}, -0.207, is negative and significant (P value < 0.001, two-tailed test). This result is consistent with H_3 where we hypothesize that CEOs are less likely to be overconfident after SOX and thus supports the conjecture that the stiff penalties in SOX for providing imprecise information affect CEO's overconfidence behavior and/or the board's preference in selecting a CEO who is less overconfident. The estimated coefficient on $Size_{it}$, -0.040 is negative and statistically significant at the one percent level (two-tailed test). This result suggests that CEOs in larger firms tend to be less overconfident. The estimated coefficients on board characteristics and the governance index are not significant, suggesting the limited role of these variables in the CEO selection process. The results are robust when additional control variables, $Horizon_{it}$, $Loss_{it}$, and $Num\_Analyst_{it}$, are included in the model (Columns [5] and [6]). In sum, results suggest that CEOs are less likely to be overconfident after SOX. Our findings are consistent with Banerjee et al.'s (2015) argument that an independent board mitigates the costs of CEO overconfidence in terms of investment and risk exposure.

Table 6. Logistic Regression: SOX and CEO Overconfidence

		Model (2a)		Model (2b)	
Variable	Predicted sign	Coefficient	Clustered Standard Error	Coefficient	Clustered Standard Error
SOX_{it}	−	-0.207***	0.025	-0.107***	0.025
$Size_{it}$	?	-0.040***	0.009	-0.014	0.010
$BoardInd_{it}$	?	0.037	0.069	0.046	0.066
$BoardSize_{it}$	?	-0.004	0.005	-0.002	0.005
$Gindex_{it}$	?	-0.005	0.004	-0.003	0.004
$Horizon_{it}$	+			0.001***	0.000
$Loss_{it}$	+			0.120***	0.039
$Num\_Analyst_{it}$	−			-0.060**	0.019
$Intercept$		0.837***	0.080	0.456***	0.083
obs. #		1,646		1,646	
Pre-SOX		511		511	
Post-SOX		1,135		1,135	
Adjusted R^2		0.056		0.146	

***, **, * indicate significance at the 0.01, 0.05 and .010 level or better, respectively. Two-tailed p value is reported.

5. Conclusion

CEO overconfidence plays a significant role in business decisions and thus affects firm performance; this results in the business community recognizing the impact of managerial overconfidence on the business operation. For example, analysts assert that Lehman's CEO's overconfidence may have been a contributing factor in the subsequent bankruptcy.

> "Fuld went wrong in not taking seriously enough the impairment of his balance sheet," said Charles Peabody, analyst at independent research firm Portales Partners. "He had typical hubris that any long term CEO has: 'I built this thing, and it's got more value than the marketplace understands'. "As the credit crisis worsened, Fuld was Wall Street's one seemingly teflon chief executive, keeping his job unchallenged even as CEOs fell at rivals like Bear, Merrill Lynch Cos Inc and Citigroup and as Fuld's own underlings including chief financial officer Erin Callan were pushed out. (*The Economic Times* September 16, 2008)

In this study, we document a statistically significant positive association between a CEO overconfidence indicator based on optimistic management earnings forecasts and bond yield spreads. These findings support the argument that the market is efficient and discounts CEO overconfidence. This evidence suggests that overconfidence of the CEO comes at a cost that may be manifested in multiple ways. For example, announcements by the CEO may be interpreted much more cautiously by investors and analysts. We suggest future research regarding whether the market interprets all aspects of a CEO's management (including communications as well as other activities in which the CEO interfaces with investors, the press, or politics) more conservatively given the CEO's history of overconfidence.

Moreover, we find that the market incorporates past CEO overconfidence information into bond pricing and requires larger premiums for issuers with a pattern of overconfidence in forecasts over time to compensate for the risk. Given that the market requires larger premiums, that are observable, it might be important to research the linkage between a higher cost of capital and strategic initiatives by the firm.

Finally, we document a consequence of SOX in CEOs becoming less overconfident and/or corporate boards seeming to prefer to appoint a rational CEO rather than an overconfident CEO because of the anticipation of possible information disclosure-related penalties. Our evidence suggests that boards seem to prefer a more moderate leader at

the helm. Accordingly, Boards seem to prefer to have a 'toned down' CEO. This result is important to academic research that focuses on market reactions to CEO announcements. From a corporate governance perspective, it is important to understand the checks and balances in place to both reward and discipline CEO behaviors. Accordingly, confidence may be rewarded, but overconfidence may be shunned. We encourage future research to investigate the boundary between confidence and overconfidence in the C-suite. Numerous questions regarding monitoring approaches and controls to mitigate overconfidence may lead to a better understanding of the workings of a CEO and the corporate board.

This study contributes the current literature on CEO behavior bias, voluntary disclosure, market efficiency, and the consequences of SOX. First, it provides evidence that one of the economic consequences of CEO overconfidence is the increased cost of debt. Second, bondholders discount CEO overconfidence based on past management forecast patterns. Finally, our findings demonstrate that SOX regulation may have impacted CEO overconfidence and/or corporations choosing CEOs with less overconfidence.

One limitation of this study is that we do not control for all possible covenant restrictions on the bonds in our regression. We have no a priori reasons to believe that our inferences are driven by this limitation. We also exclude bonds with collaterals from our sample and have no a priori reasons to believe that this impacts our inference. Overconfidence has become an important interdisciplinary concept. Future research may explore factors mitigating the effects of CEO overconfidence and its dynamic nature. In particular, it is important to better understand the corporate governance strategies undertaken by a board to counteract overconfidence by the CEO. The implications are important to both academics and the boards, themselves. For academics, research focused on information events should control for the source of the information and whether the CEO has history of overconfidence. For corporate boards, our results suggest that the choice of overconfident CEO may result in substantial costs that need to be weighed against the benefits of the CEO's confidence.

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Notes

Note 1. "VeriSign buys domain firm" http://money.cnn.com/2000/03/07/deals/verisign/

Note 2. Although we do not know the extent to which CEO overconfidence explains overpayment in this transaction, this example reveals potential shareholder losses that CEO overconfidence can lead to. Paredes (2005) also cites this acquisition.

Note 3 It is puzzling why bondholders (public debt) prefer more restrictive covenants to increasing the cost of debt given that the cost of renegotiation for public debt is high (Watts and Zimmerman 1986).

Note 4. Following Malmendier and Tate (2005), Hribar and Yang (2007) use a press-based measure and late option exercise-based measures to measure overconfidence.

Note 5. When looking at statistical analysis, it is always best to use analyses that are the best specified and have the most power; accordingly, looking at bond yields has these attributes. In general, the regressions are very well behaved and have much higher explanatory power than equity analyses.

Note 6. Paredes (2005) argues that CEOs can become overconfident as a result of high compensation and the extensive corporate control in their hands.

Note 7. Goel and Thakor (2008) make seven predictions. Prediction #1 states that the incidence of overconfidence among CEOs is higher than in the general population. Prediction #2 states that the relationship between firm value and CEO overconfidence is non-monotonic, while controlling for other factors. Prediction #3 concerns market reactions to corporate investments. Prediction #4 states that the quality of the information provided to both the board and the investors is poorer with overconfident CEOs than with rational CEOs. Prediction #5 states that, controlling for CEO risk aversion, excessively overconfident CEOs are more likely to be fired. Prediction #6 concerns market reactions to a CEO dismissal. Prediction #7 concerns the impact of information disclosure related penalties on the board's choice of CEO.

Note 8. We cannot probe this issue further because there is no internal control report requirement pre-SOX.

Note 9. There are two basic approaches in behavioral corporate finance: the irrational investors approach (e.g., Jiang et al. 2005) and the irrational managers approach. The market efficiency hypothesis is consistent with the irrational managers approach.

Note 10. Overconfidence differs in effect on firm value from low risk aversion. While lower CEO risk aversion benefits the shareholders, extreme CEO overconfidence diminishes firm value due to overinvestment.

Note 11. Many studies (e.g., Rogers and Stocken 2005; Sansing 1992; Stocken 2000) examine managers' forecast behavior when investors can assess a forecast's credibility based on the subsequent earnings report.

Note 12. Corollary 2: Suppose the CEO can choose the precision of the signal s at $t = 0$ by making an unobservable investment in information production. Then there exist parameter values such that the board prefers to choose a manager from group A as the incumbent CEO at $t = -1$ when $P = 0$. Moreover, there exists a $P > 0$ high enough such that the board's preference switches to a manager from group B as the incumbent CEO chosen at $t = -1$.

Note 13. The competition for capital may constrain CEO overconfidence because of the potential for the rising cost of capital given that firms seek new funds.

Note 14. We exclude qualitative forecasts from our sample because we have no objective criterion for determining whether such forecasts were missed.

Note 15. The classification of MEF forms (point, range, minimum / maximum, or qualitative forecasts) is based on First Call's codes for Company Issued Guidelines (CIGCODEQ) (Anilowski et al. 2007).

Note 16. Because management forecasts reported in CIG do not adjust for stock splits, we compute the actual EPS as the reported EPS multiplied by the split factor.

Note 17. Future research may employ CEO turnover data to examine the impact of SOX on CEO selection process.