

The Role of Managerial Overconfidence in the Design of Debt Covenants

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Abstract

We examine the influence of CEO behavioral characteristics on the design of debt covenants. We focus on CEO overconfidence, a trait that is prevalent among CEOs and has been shown to be associated with over-investment and value-destroying merger activity. We find that debtholders design covenants to mitigate the anticipated effects of overconfidence. Specifically, firms with overconfident CEOs face tighter restrictions on their ability to make future investments, acquisitions, and raise additional debt financing. However these restrictions are partially mitigated when firms with overconfident CEOs have greater information transparency and better past-performance and investment opportunities. While bond-holders respond with more covenants, we do not find evidence that the cost of debt is affected. Overall, our study shows that debt covenants are designed to mitigate the effects of CEO behavioral characteristics incremental to other firm and CEO specific factors documented in the prior literature.

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1. Introduction

We examine the role of CEO behavioral characteristics in the design of debt covenants. The behavioral finance literature that examines the consequences of behavioral biases of managers has primarily focused on managerial optimism and overconfidence; traits that have been shown to be prevalent in managers (see Malmendier and Tate (2005, 2008) and Ben-David, Graham, and Harvey, 2007).¹ Overconfident managers “systematically overestimate the probability of good firm performance and underestimate the probability of bad firm performance” (Heaton, 2002). As a result they have been found to display hubris (Roll, 1986) that manifests in inefficient investment decision making such as overpaying and making value-destroying acquisitions (Malmendier and Tate, 2008).

Despite the growing evidence of the effects of managerial overconfidence on corporate decisions, it is unclear whether investors rationally discern and incorporate such overconfidence in contracting with firms with overconfident CEOs. This study fills a gap in the literature by examining how debt investors contract with firms in the presence of overconfident CEOs. We particularly focus on debt contracts because Malmendier and Tate (2005) show that overconfident managers avoid equity financing and rely on internal cash and debt to fund projects. Thus, our primary research question is: how do debt investors structure public debt covenants when faced with overconfident managers accessing public debt markets for financing? Such evidence would partly shed light on an outstanding issue in the behavioral finance literature pointed in Subramanyam’s (2007) survey. He points out that “a basic question that arises from the [behavioral corporate finance] literature is whether [are] managers dealing with an irrational market, or whether a rational market dealing with irrational managers, or both.”

¹ The basis for this stream of literature is the evidence that individual beliefs are not always rational and the decisions arrived at based on these beliefs are not always consistent (see Kahneman and Tversky, 2000) and Gilovich, Griffin, and Kahneman, 2002). DellaVigna (2009) points out that the standard model of behavior in economics assumes, among other things, that individuals on average hold correct beliefs about the distribution of states of the world. Experimental evidence refutes this. DellaVigna (2009) proposes that an explanation for such incorrect beliefs is overconfidence of individuals that results from overestimation of “their performance in tasks requiring ability, including the precision of their information”.

We conjecture that bondholders demand greater covenant protection to reflect the implications of CEO overconfidence, incremental to the relevant firm risk characteristics. Models by Heaton (2002) and Malmendier and Tate (2004) demonstrate the tendency of overconfident CEOs to overinvest. Therefore, we examine whether bondholders design covenants to restrict merger and investment activities. In additional analyses, we examine whether the overconfident managers also face higher borrowing costs. Finally, we also examine if bondholders also limit the overconfident managers from their investment and acquisition activities indirectly by placing covenant restrictions on their ability to raise subsequent financing.²

While many of the predictions of managerial overconfidence are similar to moral hazard problems in agency settings, such as managerial entrenchment and perquisite consumption, CEO overconfidence and moral hazard problems are fundamentally very different. According to Baker, Ruback, and Wurgler (2004), “unlike in a traditional agency problem, which arises when there is a conflict between managers and outside investors, standard incentive contracts have little effect: An irrational manager may well think that he is maximizing value”. They therefore highlight the importance of distinguishing implications of overconfidence from the traditional agency problems in empirical work. We address this challenge through our use of a measure of overconfidence that is unrelated to moral hazard problems and we also control for managerial entrenchment in all our empirical tests. We discuss this in detail in the following paragraphs.

We follow the “revealed beliefs” approach pioneered by Malmendier and Tate (2005) to capture CEOs’ expectations with respect to future returns of their firms.³ CEO overconfidence is

² It is worth noting that we do not examine the dividend restrictions, commonly studied in the debt contracting literature while examining agency conflicts. Overconfident managers are not likely to make excessive dividend distributions, which may disadvantage bondholders, because of their strong pecking-order preference. Since they would prefer to fund projects from internal accruals, they are unlikely candidates for dividend restrictions. In unreported tests we find that the probability of attracting dividend restrictions is no different for overconfident versus non-overconfident managers.

³ Three ways to infer managerial beliefs of overconfidence have been popular in literature. The first approach is the “intrinsic beliefs approach” in which subjects are surveyed and asked to respond to a series of questions which then is interpreted by the researcher to develop a profile of the individual’s beliefs. This approach has recently been followed by Ben-David, Graham, and Harvey (2007) to determine overconfidence in CFOs. We do not follow this approach since we do not have the means to survey the sample of CEOs used in our sample. The second approach is the “perceived beliefs approach” in which third-party perceptions of the manager’s beliefs is used. This approach has been used in supplemental analysis by Malmendier and Tate (2005) by searching articles in the business press describing managers using certain keywords denoting overconfidence. The disadvantage of this approach is that it captures to a certain extent the bias of the business writer in describing the managerial attitudes. We use this

inferred from the CEO's propensity to hold in-the-money vested options in their own firm beyond optimal thresholds of risk diversification. The willingness to hold a large undiversified stake in their companies suggests that overconfident CEOs systematically overestimate the future returns of their projects. Our main measures *Post-Longholder* and *Holder67* classify CEOs as overconfident if they do not exercise any tranche of their stock-option grant until expiration or upon being fully vested, even though the option was at least 40 percent in-the-money or 67 percent in-the-money, going into the last year of expiry or into the fifth year of grant, respectively (see Appendix 1 for a detailed discussion of the variable construction). The idea is that since the CEO's wealth and human capital is already exposed to firm specific risk they should exercise their in-the-money options at the earliest (Lambert, Larcker, and Verrecchia, 1991; Hall and Murphy, 2002). The advantage of this measure is that traditional agency conflicts do not predict irrational concentration of wealth in the firm whereas it is consistent with the managers revealed overconfident beliefs.

An important alternative explanation for undiversified option holdings by managers is that managers may possess favorable private information. Malmendier and Tate (2005) undertake several robustness tests to rule out the private information explanation and find that on average managers would have been better off by exercising the in-the-money options rather than holding on to them.⁴ Further, the private information explanation would predict that bond investors could infer the good prospects from the managers' portfolio decision and we would if anything expect better terms for borrowing, whereas the overconfidence explanations predicts adverse borrowing terms.

We examine the relation between CEO overconfidence and bond covenants that place restrictions on investments and acquisitions. If bondholders recognize the potentially higher risk inherent in the organic (capital expenditures) and inorganic (acquisitions) investment decisions of overconfident managers, we should observe more restrictive covenants for such firms. We classify the different types of covenants found in public debt contracts using the groupings from

measure in supplemental analysis but report the main result using the third approach, "the revealed beliefs approach" described here. The results reported are materially similar to those using the "perceived beliefs approach".

⁴ Malmendier and Tate (2005, 2008) examine other alternative explanations for why managers hold such in-the-money options without exercising. They examine signaling, risk tolerance, tax incentives, and procrastination and rule out these alternative explanations for such option holding behavior. In the Appendix, we describe the reasons why these alternative explanations can be ruled out.

Smith and Warner (1979) and Chava et al. (2009), and focus on three groups, investment, merger, and subsequent financing covenants. We find that firms with overconfident CEOs are more likely to get investment related restrictions. Decomposing the components of these investment restrictions, we find the strongest result for merger related restrictions. The likelihood of the restrictions increases by about 9 percentage points for investment restrictions, 8 percentage points for investment restrictions excluding mergers, and 17 percentage points for merger related restrictions. These results are consistent with the view that bondholders recognize the implications of the CEO over-confidence on investment policies and respond to them by designing covenants restrictively. These effects hold after controlling for a variety of firm, bond and other CEO characteristics that may explain the presence of restrictions.

In a related study that adopts the agency conflict framework, Chava, Kumar, and Warga (2009) examine how covenant design is influenced by managerial entrenchment. They show that debtholders mitigate the bondholder-shareholder and manager-bondholder agency conflicts arising due to entrenchment by restricting the ability of the firm to make future investments, acquisitions, special payouts to equity holders, and raise additional debt financing. It is noteworthy that consistent with Chava et al. (2009) we find that a proxy for managerial entrenchment, whether the CEO is also the president and chairman of the board (*CEO Power*), is also significantly associated with higher level of merger and investment restrictions. Thus CEO overconfidence is incorporated into debt contracting and the effects are incremental to managerial agency problems traditionally studied.

We then examine if there are mechanisms that mitigate the need for restrictive covenants. If the investment opportunities and managerial performance are observable transparently, it could potentially deter value-destroying investments by the CEO and debt-holders would take that into account while designing the restrictive debt covenants. This analysis is also motivated by the fact that overconfidence of the CEO could be justified based on prior performance and the market's perceptions of the firm's investment opportunities. Also, prior literature has shown that firms that have better financial reporting quality have better borrowing terms (Bharath, Sunder, Sunder, 2008 and Graham, Li, and Qiu, 2008). Therefore we conjecture that if the firms with overconfident managers have greater information transparency with respect to performance and

project quality, it may mitigate the severity of the covenant restrictions assuming that past transparency is a credible signal of future information transparency.

We rely on three measures that generally reflect information opacity (Abnormal Accruals), investment opportunities (Market-to-Book ratio) and delivered performance (Return on Assets). The magnitude of abnormal accruals reflects the difference between earnings and cash flows and is interpreted as a measure of the noise in evaluating firm performance. The market-to-book (M/B) ratio reflects the market's perception of available investment opportunities for the firm. The return-on-assets (ROA) reflects the delivered performance by the manager. It would be rational for debt investors to incorporate this information while evaluating the contracts offered to overconfident managers since placing restrictions through covenants imposes monitoring costs on the lender. Apart from monitoring costs, the debt investors may not wish to excessively curb successful managers from pursuing cash-flow enhancing investments. Across all three measures, we find evidence that the bondholders are willing to substitute greater transparency about investment opportunities and performance, for behavioral bias. In particular, the probability of getting investment related restrictions and merger restrictions for overconfident CEOs is lower when the firms have lower abnormal accruals, higher M/B ratios, and higher ROA.

Next, we examine whether the cost of the debt is also impacted by the level of managerial overconfidence. Bondholders could potentially substitute between including more restrictive covenants and charging a higher interest on the bonds. We model the cost of debt and covenant restrictions jointly and fail to find evidence that firms with overconfident managers face higher interest costs. This suggests that debt investors are more focused on monitoring to prevent actions by managers that could put future realization of loaned amounts at risk.

Finally we examine whether debt investors restrict subsequent financing that may subordinate pre-existing claims. This could be viewed as an indirect restriction on investments and mergers since it may limit the overconfident manager's ability to raise more debt in the future. We find evidence that overconfident managers face a higher likelihood of inclusion of subsequent financing restrictions.

Taken together, our results suggest that bond investors restrict the merger and investment activities of overconfident CEOs through direct restrictions and indirectly through financing

restrictions. Yet, they do not appear to increase the interest cost of debt. Our paper contributes to four strands of literature.

First, we contribute to a growing literature on financial contracting and design of financial contracts (Roberts and Sufi, 2009) by offering an alternative view of the motivation for design of covenants. Existing literature uses the agency framework to explain contracting (e.g., Nini, Smith and Sufi, 2009; Chava, Kumar and Warga, 2009; Chava and Roberts, 2008). Managerial overconfidence manifests itself in ways that are similar to traditional agency problems, such as empire building or entrenchment. This induces them to overinvest, conduct more acquisitions and use the financing proceeds to fund their value-diminishing projects. However, unlike empire builders who derive private benefits, overconfident CEOs believe that they are acting in the interests of shareholders. Our evidence also compliments Landier and Thesmar (2009) who show that debt terms, maturity structure in their case, systematically varies for optimistic and realistic entrepreneurs.

Second, we extend the prior behavioral corporate finance literature that focuses on overconfident CEOs' suboptimal business decisions by examining the contracting response of external parties to the CEO behavioral bias. One interpretation of our results using the "irrational-manager-rational-world" approach is that rational bondholders respond to CEO overconfidence by designing covenant terms to mitigate the anticipated consequences of a behavioral bias. Such restrictions make debt financing incrementally more costly for overconfident managers reducing its attractiveness. This could provide an explanation for why firms with overconfident managers' exhibit debt conservatism to the extent of even forgoing tax benefits, a phenomenon documented in Malmendier et al. (2007). Our evidence also highlights that irrational managers could be operating in efficient markets. This evidence from public debt markets compliments evidence in Malmendier and Tate (2008) where equity investors are shown to be more skeptical of merger bid announcements made by optimistic CEOs.

Finally, we contribute to the information transparency literature by showing that transparency plays a monitoring and disciplining role in mitigating the adverse consequences of behavioral biases stemming from managerial overconfidence. Thus effects of such biases in financial contracting can be mitigated by greater information transparency at the firm level.

The remainder of this paper is structured as follows. Section 2 reviews the related literature and develops our hypotheses. Section 3 describes the data and variable measurement. Section 4 documents the empirical strategy and discusses the results. Section 5 concludes.

2. Literature Review and Hypotheses

Covenant restrictions of various kinds are commonly observed in bond contracts. To explain the wide existence of bond covenants, prior studies typically employ the analysis framework of bondholder-shareholder conflict of interest, introduced in the seminal works of Jensen and Meckling (1976) and Smith and Warner (1979). In particular, Smith and Warner (1979) summarize four scenarios in which the value of bondholders could be reduced due to such conflict of interests: (1) dividend payment, (2) claim dilution, (3) asset substitution, and (4) underinvestment (Myers, 1977). One solution for bondholders is to write covenants into the debt contract *ex ante* to prevent value-reducing actions *ex post*.

However, by focusing on the bondholder-shareholder conflict of interests, prior literature in debt contracting largely ignores the explicit influence of the specific manager in decision making. Bertrand and Schoar (2003) show that besides economic-, industry- and firm-level characteristics, managerial style also contributes to corporate decision making to a large extent. Recent research has identified overconfidence as an important managerial characteristic in explaining a variety of corporate financial actions. Hribar and Yang (2006) show that CEO overconfidence influences the type of earnings forecasts that managers make – they tend to issue more point forecasts as opposed to range forecasts. Schrand and Zechman (2009) show that overconfident managers make optimistic forecasts and in order to meet these forecasts, exhibit higher levels of fraud and earnings management. Ben-David, Graham, and Harvey (2007) use unique data from a survey of CFOs to show that personal overconfidence causes managers to miscalibrate their expectations of future returns. In turn, it influences their choices with respect to investments, debt, dividends, and stock repurchases. In an influential series of studies Malmendier and Tate (2005, 2005, and 2008) and Malmendier, Tate and Yan (2007) formalize the notion of overconfidence and provide empirical evidence of the effects of CEO overconfidence on capital investment and capital structure preferences. They find that consistent

with “managerial hubris” (Roll, 1986) overconfident managers tend to overpay and make value destroying acquisitions, exhibit strong capital pecking-order preferences, and exhibit debt conservatism. This is consistent with Baker, Ruback, and Wurgler (2005) who predict that financial policy for overconfident CEOs exhibit “pecking order” in the sense that overconfident managers prefer internal resources and debt and issue equity only when necessary..

If a lending agreement is designed rationally, it should incorporate the managerial characteristics into the contract. A recent study by Chava, Kumar and Warga (2009) pursues this line of inquiry and examines the effect of managerial agency risk on the use of bond covenants. They find when the managerial agency risk is high, in particular entrenchment and fraud, bondholders are more likely to write investment, merger and acquisition, subsequent financing, and event-specific restrictions. Extending this line of study, we propose an alternative explanation for the determinants of bond covenants. We argue that CEO behavioral characteristics, namely overconfidence, have an important role in the design of bond contract which is incremental to the managerial agency conflicts studied earlier.

While prior literature has documented the financial policy consequences of overconfident managers, it does not fully explore why overconfident managers appear to use debt cautiously. We fill this gap in the literature by exploring whether rational bondholders design contracts to counter the behavior of overconfident CEOs which in turn would impose additional costs on the CEO by restricting their ability to invest based on their private optimistic beliefs. Bondholders’ value will be hurt if suboptimal investment by overconfident CEOs involves large cash payment or assets substitution activities. Therefore, we conjecture that:

Hypothesis 1: *Bond contracts are more likely to include investment related restrictions if the CEOs are overconfident than if they are not.*

Malmendier and Tate (2008) further find that overconfident CEOs are more likely to engage in value-destroying merger and acquisitions. The market reaction around the merger announcement date is significantly more negative for overconfident CEOs than for rational CEOs. Merger restrictions can be used to limit manager’s discretion in using mergers to increase the leverage ratio and/or the variance of the firm to the detriment of bondholders. Therefore, we state our second hypothesis as follows:

Hypothesis 2: *Bond contracts are more likely to include consolidation and merger restrictions if the CEOs are overconfident than if they are not.*

While the first two hypotheses emphasize the monitoring terms that debtholders may put in place, imposing covenant restrictions is not costless for the lender because covenants effectively increase monitoring effort required by the lender. There are potential mitigating factors that may affect the intensity of monitoring that is required. The overconfidence of CEOs may originate from their confidence in the available investment opportunities of the firm or the realized performance from the past. To the extent that the investment opportunities or realized performance are observable and expected to be sustainable the debtholders may optimally relax the extent of monitoring through restrictive covenants. The market-to-book ratio (M/B) can be viewed as indicative of the investment opportunity set of the firm and the return-on-assets (ROA) is indicative of the ability of the CEO to realize profits from the past investments.

Further, if lender is confident about their ability to reliably estimate the investment opportunity set of the firm and the resulting performance, it would deter investments in underperforming projects by the CEO. For example, Chava et al. (2009) find that covenant restrictions are fewer for entrenched managers when there is a greater degree of information transparency about the investment opportunities. Prior literature has identified the role of abnormal accruals in measuring information opacity of the firm. Higher levels of abnormal accruals lead to a greater wedge between current earnings and cash flows making it harder to reliably estimate future cash flows. Bondholders trade off the risk associated with CEO overconfidence with the adverse effects of excessive monitoring. We therefore conjecture that information opacity would increase the use of restrictive covenants while realized profitability and investment opportunities mitigate the effect of overconfident CEOs on bond covenants. We state our hypothesis as follows:

Hypothesis 3: *For firms with lower industry-adjusted abnormal accruals, higher ROA, and higher market-to-book ratio, (i) the relation between overconfident CEOs and investment related restrictions is less positive, and (ii) the relation between overconfident CEOs and consolidation and merger restrictions is less positive.*

While investment and merger restrictions directly impose limits on the CEO's *ex post* investment behavior, bondholders could use additional mechanisms that indirectly influence the CEO's behavior. Rational bondholders should put more subsequent financing restrictions in order to limit an overconfident CEO's ability to raise additional funds at will and to use those funds to make investments or acquisitions. Thus, we state our next hypothesis as follows:

Hypothesis 4: *Bond contracts are more likely to include subsequent financing restrictions if the CEOs are overconfident than if they are not.*

3. Data and Variable Measurement

3.1 Data

We use Mergent Fixed Income Securities Database (FISD) to obtain bond issuance information. FISD contains comprehensive covenant restriction data for each bond issuance, which is the key focus of this paper. We select all bond issuances for U.S. non-financial firms from 1980-1995, the period for which our overconfidence measures are also available. Restricting our analysis to this time period allows us to interpret our results in the context of the prior literature on CEO overconfidence that also uses the same period. We exclude Yankee, Canadian, and foreign currency bonds.

Our CEO overconfidence data is the same as that used in Malmendier and Tate (2008). It is based on the hand-collected CEO stock and option holdings data in Yermack (1995) and in Hall and Liebman (1998)⁵. The unique feature of the data is that it provides detailed picture of CEO equity portfolio rebalancing over time. Such detailed information is the basis for overconfidence measures and this data cannot be obtained from widely-used machine readable compensation databases, such as ExecuComp. The sample contains 477 large publicly traded U.S. firms from 1980 to 1994. To be in the sample, a firm must be in one of the lists of the Forbes magazine largest U.S. companies at least four times during the period 1984 to 1994.

We then merge the CEO data with the FISD bond data and supplement it with financial variables from Compustat. We exclude all firms in the financial industry and this gives us the

⁵ Please refer to Yermack (1995) and Hall and Liebman (1998) for detailed description on data construction, and Malmendier and Tate (2005, 2008) for how to utilize the data to measure overconfidence.

final dataset for the inclusion of covenant restriction tests. It consists of 638 bonds issued by 331 firms.

3.2 Measuring CEO Overconfidence

Our CEO overconfidence measures are based on the “revealed beliefs” from CEOs’ delayed option exercise behaviors. Unlike the standardized, exchange-traded options, executive stock options are non-transferable. CEOs cannot hedge the risk in the option by short selling their companies’ stock. Moreover, CEOs have also invested huge amount of their human capital in the companies. Therefore, they are highly exposed to the idiosyncratic risk of the company that they manage. Rational risk-averse executives should exercise their vested option as early as possible as long as these options are sufficiently in-the-money. The exact exercising threshold depends on many factors including, CEO’s degree of risk aversion, option duration, and their individual wealth (Hall and Murphy, 2002). However, if the CEOs are overconfident about the future outcomes of their investments, they may still want to hold the in-the-money option even if it is well above the theoretical exercise threshold in order to profit from future stock price appreciation. Malmendier and Tate (2008) explore this insight and construct empirical measures of CEO overconfidence.

The primary measure, labeled *Longholder* is an indicator variable that equals one if the CEO has ever held an option until expiration during their tenure even though the option is at least 40 percent in-the-money. The 40 percent threshold is based on the rational option exercising model by Hall and Murphy (2002) and assumes that the CEO has constant relative risk-aversion of 3 and 67 percent of their wealth in the company stock. *Longholder* will be a CEO fixed effect throughout his tenure under the assumption that it is CEO specific behavioral trait that is invariant over time. Also, since the *Longholder* variable requires the CEO to postpone exercising the option till maturity, usually 10 years after option grant, they must have consistently been delaying the exercise since the option vesting which is usually 5 years after grant. This supports the idea that overconfidence is a CEO trait that remains persistent over time.

Our research design is conditional on information available at the time of debt contracts, so we use a stricter definition of overconfidence, *Post-Longholder*, an indicator variable that takes the value of 1 the first time any of the options are in-the-money over the 40 percent threshold.

We classify the CEO as overconfident in all subsequent years. This allows us to assume that the overconfident behavior is observable to the external contracting parties, such as bond investors in our case.

In additional tests, we also identify the overconfident CEOs in periods prior to when the overconfident portfolio holding (i.e. periods prior to classification as *Post-Longholder*). We classify the CEOs in the prior period using an indicator variable, *Pre-Longholder*. We expect to see similar results for the *Pre-Longholder* as for the *Post-Longholder* observations, although we expect the effect to be weaker for the *Pre-Longholder* variable. Using these variables, we can compare overconfident CEOs with non-overconfident CEOs as well as compare the CEOs over time, i.e. before and after their overconfident behavior is observable

We use an alternative measure, *Holder67* also introduced in Malmendier and Tate (2005). This measure considers the CEO option exercising decision with respect to options that have 5 years remaining duration and are at least 67 percent in-the-money. The intuition behind this measure is to observe all CEOs whose options have just vested, assuming that the typical vesting period during our sample is 4 years. If these options are substantially in-the-money, as indicated by the Hall and Leibman (1988) threshold of 67 percent, and remains unexercised then the CEO is designated as overconfident. All CEO firm-years are classified as *Holder 67* after the first time the CEO fails to exercise such option.

Using *Holder 67*, the CEO-year sample is restricted to all CEO years with options that have 5 year remaining duration and are at least 67 percent in-the-money. This selection criterion ensures that all the CEOs in the sample have been considered for classification as overconfident. This measure allows for over-time variation in CEO behavioral bias and explores the possibility that CEO behavioral bias may not be persistent over time. For instance, in 1987, Theodore Brophy from the G T E Corp delayed exercise of options that were more than 67 percent in-the-money with 5 years of remaining duration. In previous years, Brophy chose not to exercise his options which were more than 67 percent in-the-money with 5 year remaining duration. The company issued five bonds before 1987 and it offered three more after Theodore Brophy exhibited overconfidence. The downside to using the *Holder67* measure is that it reduces the sample size considerably to 165 firms with 278 bonds.

A potential source of concerns with all these measures of overconfidence is that they rely on non-exercise of in-the-money vested options. There could be explanations other than overconfidence which can also be consistent with such behavior. In order to provide confidence that these measures indeed capture overconfidence, Malmendier and Tate (2005, 2008) consider alternative explanations for non-exercise, namely, availability of inside information and signaling of private information by the CEO. Further, if the CEO is not risk averse, he may prefer to hold the option to maturity to retain the option value. Other reasons include tax incentives for the CEO and procrastination. They rule out all of these alternative explanations and we refer the reader to page 2675-2679 of Malmendier and Tate (2005). We therefore adopt their portfolio measures to study the effect of CEO overconfidence on bond covenants to be consistent with the prior literature and to allow us to interpret our results in the context of their findings.

3.3 Bond Covenants Classifications

FISD captures data for more than forty types of covenant restrictions. We focus our analysis on investment related restrictions and use the major categories documented in Smith and Warner (1979). We include restrictions on both the parent company and subsidiary. We first define a broad category of investment restrictions for each bond issuance, which includes all merger restrictions, direct investment restrictions, indirect investment restrictions, asset disposition restrictions, or whether the bond is secured by assets. Merger related covenants restrict a consolidation or merger by the issuing firm. Indirect investment restrictions include restrictions on transactions with affiliates, fixed charge coverage, minimum net worth requirements, restrictions on redesignating subsidiaries, subsidiary fixed charge coverage, and after acquired property clause. Following Chava et al. (2009), we define *All Investment* as an indicator variable for each bond, which takes the value 1 if the bond agreement contains at least one of the above mentioned investment restrictions. We then decompose this covenant category into merger related restrictions (*Merger and Acquisition*) and others, which we interpret as primarily restricting investments in organic growth (*Investment excluding M&A*). We also examine *Subsequent Financing Restrictions*, an indicator variable which takes the value 1 if the bond agreement contains one of the following restrictions: subordinate debt issuance restrictions,

restrictions on sale and lease obligations, restrictions on debt priority, and stock issuance restrictions.⁶

3.4 Cost of Debt Variables

In additional analyses, we use the cost of debt as measured by the treasury spread which is the offering yield at the time of bond issuance less the yield on a treasury bond of similar maturity. To control for variation in interest spreads over time, we also include *Credit Spread*, the difference between Moody's Seasoned Corporate Bond Yields on BAA versus AAA bonds, measure at the time of bond issuance. Data on corporate bond yields is obtained from the Federal Reserve Bank website.

3.5 Measuring Information Transparency

To capture the underlying notion of firm-level financial information transparency, we use an accrual-based metric derived from Jones (1991) and modified in Dechow, Sloan, and Sweeney (1995).

The modified Jones model estimates the following regression for each industry-year:

$$\frac{TA_{it}}{Assets_{i,t-1}} = \gamma_0 \frac{1}{Assets_{i,t-1}} + \gamma_1 \frac{\Delta Rev_{i,t}}{Assets_{i,t-1}} + \gamma_2 \frac{PPE_{i,t}}{Assets_{i,t-1}} + \eta_{it}$$

All variables in the regression are deflated by lagged total assets. We require at least 8 observations in each regression. The estimated coefficients are then used to compute NA (the normal accruals) for each firm-year. That is:

$$NA_{it} = \hat{\gamma}_0 \frac{1}{Assets_{i,t-1}} + \hat{\gamma}_1 \frac{\Delta Rev_{i,t} - \Delta AR_{i,t}}{Assets_{i,t-1}} + \hat{\gamma}_2 \frac{PPE_{i,t}}{Assets_{i,t-1}}$$

⁶ Besides the groups of covenants analyzed in this paper, Smith and Warner (1997) also document another type of covenants, i.e., covenants specifying bonding activities by the firm. It consists of (1) Required reports, (2) Specification of accounting techniques, (3) Officers' certificate of compliance, and (4) The required purchase of insurance. We choose not to analyze this type of restriction because the restriction information is not available in FISD and also we do not have a specific hypothesis about the effect of overconfident CEO on such covenants. The other category of covenants mentioned by Smith and Warner (1997) that we do not analyze are the dividend restrictions since we do not expect these to be important to contract upon for overconfident managers who prefer to fund projects from internal accruals. In unreported tests this is confirmed.

ΔAR is change in account receivable. We then take the absolute value of the difference between TA (the total accruals) and NA (the normal accruals) to create our variable, *Abnormal Accruals*. Large magnitudes of *Abnormal Accruals* imply significant deviations between earnings and cash flows for a given firm year after controlling for normal determinants of accruals. Such deviations introduce noise in evaluating a firm's earnings and cash flows and indicate higher uncertainty about firm's real economic performance. Therefore *Abnormal Accruals* is decreasing in information transparency.

We measure the attractiveness of the investment opportunity set and the prior track record of the firm with respect to investments using M/B and ROA. ROA is averaged over the three years prior to the bond issue to capture a more persistent measure of performance. M/B is measured at the end of the latest fiscal year prior to bond issuance.

3.6 Control Variables

To model economic factors that may explain the covenant design, we include bond-level, firm-level as well as CEO-level control variables. We control for bond-specific characteristics using *Maturity*, which is the maturity period (calculated in months) of the bond; *Concentration*, which is the log of the ratio of bond offering to total assets. We also include indicator variables for call (*Callable*), put (*Putable*), and convertible (*Convertible*) features of the bond. We also control for bonds that are privately placed under SEC Rule 144A since they have different disclosure and liquidity characteristics.

We control for firm specific characteristics that proxy for the risk faced by bondholders. We consider *Market-to-Book* of assets; *Leverage*, measured as long term debt scaled by assets; *Size*, which is the log of assets, *Tangibility*; measured as net PPE scaled by assets, and *Profit*, measured as net income scaled by assets. All these control variables are measured for the fiscal year ending prior to the bond issuance. In addition we control for credit risk of the borrower using the *Altman Z-score*. In unreported tests we also use the credit-rating and the results are materially unchanged. However, we choose to report the *Altman Z-score* results since using the credit-rating limits the size of the sample considerably.

In addition to the abovementioned firm characteristics, we also control for past observable behavior of the firm on the dimension that is sought to be restricted by the covenants. This is to

control for any covenant restrictions that may be originating as a response to past investment and merger activity by the firm. For instance, when we examine the inclusion of investment restrictions excluding mergers, we control for the firm's average capital expenditures and R&D over the prior three years (*Past Capex and R&D*). Similarly, when we examine merger restrictions, we control for *Past M&A*, which is the past 3 year average M&A expenditure of the firm. *Past Investment* includes both *Past Capex and R&D*, and *Past M&A*. For the subsequent financing restrictions, we include *Past Net Debt Issuance*, which is the past 3 year average net debt issuance of the firm. All the activity variables are deflated by lagged total assets.

At the CEO level, we control for *Stock Ownership*, which is the total stock in the company owned by the CEO and his immediate family divided by the total common shares outstanding, which is a proxy for the bondholder-shareholder conflict used in prior studies (Begley and Feltham, 1999). We control for *CEO Power*, an indicator variable that takes the value of one if the CEO is also Chairman of the Board and President, 0 otherwise. This is our proxy for CEO entrenchment and is similar to the *CEOChair* variable used in Chava et al. (2009). We control for these variables to ensure that our measures of CEO overconfidence pick up effects incremental incentive and entrenchment effects already documents in other papers. We also control for *Vested Options*, which is the number of option holdings that are vested within six months since the beginning of the year divided by total common shares outstanding.

3.7 Descriptive Statistics

Table 1 presents descriptive statistics of the sample. Panel A provides firm-level summary statistics. Our sample firms are generally large and profitable. This is to be expected given that the firms have been featured on the Forbes' top 500 lists. The median total assets are \$ 4.5 billion. The sample primarily consists of firms that are relatively strong financially with the median profitability at 4 percent of total assets. The median Z-Score is 2.56. As firms with Z-Score < 1.80 are considered financially distressed, our sample firms are quite healthy.

Panel B shows the summary statistics of CEO-level variables. The CEOs are in charge of their firms for about 8 years. Using the *Longholder* variable for overconfidence, about 10 percent of the sample firms have an overconfident CEO at some point and using the *Holder67* metric, 55 percent of the CEOs are classified as overconfident within the relevant sub-sample of 165 firms.

Panel C illustrates the characteristics of the bonds issued. Bonds are generally used for long-term financing. The average maturity is about 194 months (17 years). This is partly driven by FISD coverage of larger bonds during our sample period. Panel D presents the Fama-French 12 industry distribution of the sample. As we can see, a variety of industries have issued bonds during the sample period. There are more bond issuances from manufacturing (22 percent), shops (12 percent), and utility firms (10 percent). We exclude financial firms from our sample. Due to the industry concentration and variability of the distribution, we control for industry effects in all our multivariate tests.

4. Methodology and Results

4.1 Determinants of Bond Covenant Restrictions

4.1.1 Research Design

We use a probit model to study the inclusion of bond covenants in response to CEO overconfidence. We estimate the following regression model at the bond level:

$$\Pr(\text{Covenant Restriction}_{it} = 1) = \Phi(\beta_0 + \beta_1 OC_{it} + X\beta)$$

Covenant Restriction represents one of the four categories of restrictions examined in the paper, i.e. all investment restrictions, investment restrictions excluding mergers, merger restrictions, and subsequent financing restrictions. *OC* is the overconfidence metric, measured as *Post-Longholder* or *Holder67*. *X* is a set of control variables that have been identified in prior literature to influence debt contract design. Φ is the cumulative normal distribution function. We include industry effects using Fama-French 12 industry classification. To address the concern of multiple issuances by the same firm and multiple bond issues in a year, we correct the standard errors using two-way clustering by firm and year.⁷

4.1.2 Results for Covenant Restrictions

Table 2, Panel A presents the probit results on the relationship between CEO overconfidence and the inclusion of investment related restrictions in bond contracts. In this

⁷ In unreported robustness tests, we include only one bond per firm, i.e. we pick the largest bond when there are multiple bond issuances in a given year. All reported results materially hold in such an analysis.

table, overconfidence is measured using *Post-Longholder*, which is observable to bondholders. In specification (1) we examine the inclusion of all types of investment restrictions. Consistent with Hypothesis 1, we find a significantly positive relation between *Post-Longholder* and the inclusion of investment related restrictions. The probability of including any investment related restriction increases by approximately 9 percentage points for firms with an identifiable overconfident manager (*Post-Longholder*) relative to all other firms (marginal effects of the probit model are not reported). We then parse the overall investment restrictions into restrictions related to merger activities (i.e. restrictions on inorganic growth), and all other investment restrictions (i.e. restrictions on organic growth). We find for both categories of investment restriction, the coefficient is positive and significant. This represents an economically significant increase in the probability of including a restriction by 9 and 17 percentage points for investment restrictions excluding mergers and for merger related restrictions respectively.

Begley and Feltham (1999) use equity ownership as one of their variables to proxy for agency conflicts between bondholders and shareholders and while they do not explicitly examine investment related covenants, we control for these agency effects in our tests. Further, we control for managerial power and find that it has a significantly positive effect on investment restrictions consistent with Chava et al. (2009). Therefore our results on *Post-Longholder* can be interpreted as being incremental to any effects due to agency conflicts or managerial entrenchment. We control for firm and bond characteristics and industry fixed effects. We find that the likelihood of an investment restriction is increasing in leverage and in the case of mergers, it is decreasing in asset tangibility.

Prior literature shows that overconfident CEOs tend to make suboptimal investment decisions. Therefore bondholders could potentially observe a firm's past investment history and design covenants restrictions accordingly. We therefore control for past firm level investment, merger and financing activities as the case may be in each of the relevant regressions. This allows us to tease out the effects associated with observable past investment behavior of the firm over the prior three years versus the CEOs revealed overconfidence. We generally find that past investment behavior is not relevant after controlling for other firm characteristics.

In Panel B of table 2, we present the results for the alternative measure, *Holder67*. We find that across all categories of investment restrictions, the likelihood of inclusion of an

investment related covenant is higher for overconfident CEOs. More profitable firms are less likely to face restrictions, consistent with restrictions being a bondholder response to firm risk. Taken together, Table 2 shows that when the CEO is overconfident, bondholders consistently respond by including restrictions on investments of all types.

Next, we compare the effects on covenant inclusion of *Post-Longholder* with *Pre-Longholder*. This reflects the bonds issued by the overconfident CEO in the years prior to when the overconfidence in the option portfolio can be observed. Malmendier and Tate (2005, 2008) do not distinguish between these two periods since CEO overconfidence is a CEO fixed effect. However since we are modeling the bondholders' response to the overconfidence, we require that this overconfidence is observable. However it is possible that even in the *Pre-Longholder* period, there are other signs of overconfidence by the CEO that are unobservable to the researcher since the *Post-Longholder* variable classifies an overconfident CEO as such only in the tenth year of the option. In any case, we expect that the effects should be stronger for bonds issued in the *Post-Longholder* time period because the overconfidence is confirmed by the option holding behavior.

Table 3 reports the results of controlling for *Pre-Longholder*. This sample allows us to compare the contracts that bondholders design for overconfident CEOs before and after the overconfidence is observed. We find that both *Pre-Longholder* and *Post-Longholder* face higher investment restrictions in all three specifications. Further, the coefficient on *Post-Longholder* is significantly higher than that for *Pre-Longholder*. However, this result is primarily driven by merger restrictions. We interpret this result as suggesting that bondholders are more worried about potential value destroying mergers when CEO have over-extended option portfolios and are relatively less concerned about organic growth. We continue to find evidence that CEO entrenchment measured as CEO Power increases the likelihood of covenant inclusion. This confirms the results in Chava et al (2009) in a different time period.

4.2 Role of Information Transparency, Delivered Performance, and Growth Opportunities

Table 4, Panel A presents the effect of information transparency using the magnitude of abnormal accruals on the relation between CEO overconfidence and bond covenants. If information transparency helps to monitor the investment decisions of the overconfident CEO,

then the risk of overinvestment is partially mitigated, leading to a lower likelihood of restrictive covenants. We find that *Post-Longholder* increases the investment restrictions, primarily merger restrictions, even if the magnitude of abnormal accruals is zero which is the theoretical best case. Further, as information transparency decreases, the overconfident CEO faces increasing likelihood of restrictive covenants. This is true for overall investment restrictions and investment restrictions excluding mergers (specifications 1 and 2). This provides evidence that at least in the case of organic growth, information transparency is valuable for evaluating the extent to which the overconfident CEO's subsequent investment decisions should be curtailed.

Panel B on Table 4 reports the results with respect to information available on the availability of the growth opportunities. Investment and financing restrictions are relatively more costly for firms with genuinely high growth opportunities and this may mitigate the costs of having an more loosely monitored overconfident CEO. Bondholders should potentially trade-off the costs of excessive restrictions against the costs of lending without restrictions to the overconfident manager. If bondholders can independently verify that the overconfident CEO indeed has available growth opportunities, such overconfident CEOs would face fewer restrictions. Using M/B as a proxy for observable investment opportunities, we find evidence that higher M/B are associated with lower likelihood of overall investment restrictions and merger restrictions.

Finally, overconfident CEOs of firms with a demonstrated track record of abnormal performance could face fewer restrictive covenants if bondholders believe that the CEO can deliver on the expectations. We use past ROA as a proxy to indicate the ability of the CEO to deliver superior performance in line with their manifest overconfidence. The results presented in Panel C, are very similar to the previous two panels. While *Post-Longholder* by itself increases the likelihood of investment restrictions, particularly merger restrictions, the likelihood of inclusion decreases as the ROA increases.

Overall the results in Table 4 suggest that while firms with overconfident CEOs in general face more restrictive covenants, those overconfident CEOs of firms with greater information transparency, better assessed investment opportunities and better demonstrated profitability are relatively less likely to face inclusion of restrictive covenants, particularly in the case of merger restrictions.

4.3 Cost of Debt

We estimate the initial cost of bonds at issuance using an OLS model and regress the treasury spread on our measure of overconfidence, controlling for firm, bond and CEO characteristics. We also control for the overall investment restrictions and interact *Post-Longholder* with the restriction. We examine whether the overconfident CEO is willing to pay a higher cost of debt to avoid the restrictive covenants. However, the cost of debt is not decided independently of the covenants and therefore we also use a seeming-unrelated-regression (SURE model) specification to account for the joint determination of interest and covenant restrictions. We find that in the OLS model in specification (1) the cost of debt is significantly higher for overconfident CEOs without any investment restrictions. However those with investment restrictions do not face any incremental costs relative to non-overconfident CEOs with restrictions (i.e., $Post-Longholder + Post-Longholder * Investment\ Restriction$ is not significantly different from zero). However in the SURE estimation, we find that the cost of debt is not significantly different for overconfident CEOs regardless of the inclusion of restrictive covenants compared with non-overconfident firms with similar restrictions. Overall, we do not find consistent evidence that overconfidence is priced even though we find strong evidence that it does affect the design of monitoring mechanisms.

4.4 Restrictions on Subsequent Financing

In addition to the investment related covenants that directly restrict the subsequent investment activities of the overconfident CEO, we examine whether bondholders indirectly curtail their ability to invest by restricting subsequent financing. We examine the likelihood of including a covenant restricting subsequent financing and the results are reported in Table 6. We find that for both *Post-Longholder* and *Holder67* variables, there is a significant increase in the likelihood of having a subsequent financing restriction for overconfident CEOs. This could further explain the observed debt conservatism of overconfident CEOs documented in prior literature.

5. Conclusion

Traditional studies of debt contracting are based on the framework of bondholder-shareholder conflict of interests and link economic-, and firm-level characteristics to bond

covenants. We propose another determinant of bond covenants that arises from the behavioral characteristics of CEOs. In particular, we examine whether a specific CEO behavioral characteristic, i.e., overconfidence, affects the likelihood of including restrictions on investments, mergers and subsequent financing. We also examine the role of information transparency and the ability of the bondholders to satisfy themselves of the availability of profitable investment opportunities in mitigating the use of restrictive covenants in debt contracts. .

We find that bond contracts are more likely to include investment related restrictions, consolidations and merger restrictions, and subsequent debt financing restrictions, if the CEOs of the firms are overconfident than if they are not. These results are consistent with the view that (1) overconfident CEOs influence firm policies that are detrimental to the value of bond holders; (2) bond holders rationally recognize these implications and impose additional restrictive covenants when dealing with an overconfident CEO. As a result, debt financing is relatively more expensive for the overconfident CEO and he is likely to face restrictions on subsequent financing. Together, these results also suggest an explanation for why overconfident managers appear to underuse debt. Information opacity plays an important monitoring role in mitigating the consequences of the behavioral bias. Given the growing literature that documents the consequences of managerial overconfidence on firm financing decisions, our study fills a gap in the literature by examining how external parties can rationally contract with such managers. We show that bondholders increase the use of restrictive covenants to counter the effects of CEO overconfidence.

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Appendix I: Construction of the Overconfidence Measures

We use the overconfidence data used in Malmendier and Tate (2008), which is slightly modified version of the overconfidence measures used in Malmendier and Tate (2005). We describe the approach followed for constructing these measures.

The data for constructing the portfolio overconfidence measures is from Hall and Liebman (1998) which is turn based on the Yermack (1995) hand-collected dataset. In order to be in the sample, the firm must be on one of the Forbes lists at least four times during 1984-1991. Hall and Liebman (1998) extend the sample to cover the 1980-1994 period and construct a panel dataset of stock option grants and option holdings from annual proxy statement information. They note that most of the options expire in 10 years and are fully vested by four years. Malmendier and Tate (2005, 2008) use the grant by grant data available in the dataset to construct the two measures that we use in this paper.

Longholder: A CEO is classified as a *Longholder* if at any time during the sample period, he holds any of his option grants till expiration (tenth year) even though it is at least 40% in the money by the end of the ninth year. In other words, if in any year, the option portfolio of the CEO contains an unexercised in-the-money option grant that expires in that year, the CEO is classified as a *Longholder*. The in-the-moneyness threshold of 40% for year ten is derived from Hall and Murphy (2002). However most of the options held past the ninth year are much more profitable with the median option grant being 253 percent in the money. This behavior is interpreted as delayed exercise since these CEOs are intentionally not exercising in the money options till maturity, which is not rational if we assume that the CEO is risk-averse and has his wealth concentrated in the firm. They then define a variant of this measure, *Post-Longholder* which is an indicator variable that takes the value 1 for all years starting with such delayed exercise behavior, zero otherwise. *Pre-Longholder* is the indicator variable that takes on the value 1 for *Longholder* CEOs when *Post-Longholder* is zero.

Holder67: The second measure examines exercise behavior at a point in time when the options are vested (year five during their sample period). They first examine CEO portfolios which have an unexercised option grant in its fifth year that is at least 67 percent in the money at some point during that fifth year. Again the 67 percent in-the-moneyness threshold for year five is from Hall and Murphy (2002) and is based on assuming a risk-averse manager with constant relative risk aversion of 3. Further, they require at least two such instances for a given CEO during the sample period to allow for enough opportunity to observe any overconfident behavior. If the CEO does not exercise any part of the grant in the fifth year, then he is considered as overconfident and remains classified as such for the rest of the sample period. Since this measure requires CEOs to have 67 percent in-the-money option grants that are in their fifth year at least twice during the 1980-94 time period, this criterion shrinks the sample size relative to the *Longholder* measure.

Alternative explanations

One concern that users of these measures need to address is whether the delayed exercise behavior is proxying for something other than overconfidence. Malmendier and Tate (2005) examine several alternative explanations for such a portfolio holding behavior as opposed to CEO overconfidence. We briefly discuss here their robustness tests to rule out the other explanations.

1. Inside information – They find that delayed exercise behavior appears to be sticky rather than time-varying and highly dependent on whether the CEO delayed exercise in the past. If indeed the delayed exercise was opportunistic then we would not expect it to be sticky for a given CEO who may sometimes have good private information and sometimes bad private information. Second, they examine subsequent returns to the delayed exercise behavior and find that the returns are not higher when exercise is delayed and the CEO would have been better off exercising earlier. This finding is again inconsistent with the CEO using good private information to delay option exercises.
2. Signaling – Another possibility is that CEOs may be signaling that the firm is undervalued through their delayed exercise. However if this was a successful signaling device, we would expect that it should alleviate information problems and therefore reduce the investment-cash flow sensitivity. Whereas, the delayed exercise in fact increases the investment-cash flow sensitivity which is consistent with CEO overconfidence.
3. Risk-tolerance – if the assumption of CEO risk-aversion does not hold, we may expect delayed exercise but again this has no predictions for investment cash flow sensitivity unlike the overconfidence explanation.
4. Tax reasons – CEO's may delay exercise to postpone paying taxes but this explanation should not suggest systematic differences in investment-cash flow sensitivity.
5. Procrastination – If CEOs face inertia when acting on their own personal account, it may reflect in inertia when acting for the firm. In another study that uses the same variables, Malmendier and Tate (2003), the authors find that CEOs who delay exercise are in fact more likely to make acquisitions and do not display inertia.

The above robustness analysis along with the results in Malmendier and Tate (2005, 2008) suggest that the measures of delayed option exercise are more representative of CEO overconfidence than the other alternative explanations.

Table 1: Summary Statistics

This table provides summary statistics for variables in the main sample (N=638). *Profit* is net income divided by total assets. *Leverage* is long-term debt divided by total assets. *Assets* is total assets. *Tangibility* is net PP&E divided by total assets. *Market-to-Book* is book value of debt plus market value of equity divided by total assets. *Concentration* is log of (bond offering amount/total assets). *Z-Score* is $1.2 (\text{working capital} / \text{total assets}) + 1.4 (\text{retained earnings} / \text{total assets}) + 3.3 (\text{EBIT} / \text{Total Assets}) + 0.6 (\text{Public value of equity} / \text{Book value of total liabilities}) + (\text{Sales} / \text{Total Assets})$. *Past Capex and R&D* is the past 3 year average capital expenditure and R&D expenditure of the firm. *Past M&A* is the past 3 year average M&A expenditure of the firm. *Past Net Debt Issuance* is the past 3 year average net debt issuance of the firm. *Abnormal Accruals* is the accounting quality measure estimated by the modified Jones model. *ROA* is the past 3 year average ROA of the firm. *Stock Ownership* is the number of shares owned by the CEO and his immediate family divided by the total common shares outstanding. *Vested Option* is the number of option holdings that are vested within six months divided by total common shares outstanding. *CEO Tenure* is an indicator variable that takes the value of one for CEOs whose tenure falls in the top 25% of the sample, 0 otherwise. *CEO Power* is an indicator variable that takes the value of one if the CEO is also Chairman of the Board and President, 0 otherwise. *Longholder* is an indicator variable that equals 1 if the CEO at some point during his tenure held an option until the last year before expiration and the option was at least 40% in-the-money entering that year, 0 otherwise. *Post-Longholder* is an indicator variable equal to 1 for CEO-years after the CEO for the first time holds options to expiration. *Pre-Longholder* is an indicator variable equal to 1 for CEO-years that are classified as 1 under *Longholder*, but 0 under *Post-Longholder*. *Holder 67* is an indicator variable that equals to 1 for all CEO years after the CEO for the first time fails to exercise a 67% in-the-money option with five years remaining duration, 0 otherwise. *TOTALconfident* is an indicator variable equal to 1 if the number of “confident” and “optimistic” mentions for a CEO in the LexisNexis and The Wall Street Journal searches exceeds the number of “not confident,” “not optimistic,” and “reliable, cautious, practical, conservative, steady, frugal” mentions, 0 otherwise. *Offering Amount* is the value of debt initially issued. *Maturity* is the maturity period (in months) of public bond. *Callable* is a dummy variable that equals 1 if the bond has call feature, 0 otherwise. *Puttable* is a dummy variable that equals 1 if the bond has put feature, 0 otherwise. *Private Placement* is an indicator variable that equals 1 if the bond is rule-144a, 0 otherwise. *Convertible* is a dummy variable that equals 1 if the bond is convertible, 0 otherwise. Fama–French 12 Industry Groups is defined by Professor Kenneth French at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Panel A: Firm Characteristics

	Obs.	Mean	Median	Std. Dev.	Min.	Max.
Profit	331	0.04	0.04	0.06	-0.25	0.33
Leverage	331	0.25	0.25	0.13	0.00	0.73
Assets (\$bln)	331	7.72	4.49	8.52	0.12	63.83
Tangibility	331	0.48	0.45	0.21	0.04	0.92
Market-to-Book	331	1.47	1.25	0.65	0.73	4.85
Z-Score	331	3.00	2.56	1.96	0.50	17.90
Past Capex and R&D	331	0.10	0.09	0.06	0.00	0.46
Past M&A	331	0.02	0.01	0.04	-0.01	0.19
Past Net Debt Issuance	331	0.02	0.01	0.05	-0.34	0.32
Abnormal Accruals	324	0.12	0.03	0.44	0.00	5.85
ROA	331	0.05	0.05	0.05	-0.30	0.30

Table 1: Summary Statistics (continued)**Panel B: CEO Characteristics**

	Obs.	Mean	Median	Std. Dev.	Min.	Max.
Stock Ownership	331	0.02	0	0.05	0	0.36
Vested Options	331	0.02	0.01	0.04	0	0.39
CEO Tenure	330	8.55	6	8	1	41
CEO Power	331	0.38		0.49	0	1
Longholder	331	0.18		0.39	0	1
Pre-Longholder	331	0.1		0.3	0	1
Post-Longholder	331	0.08		0.27	0	1
Holder 67	165	0.55		0.50	0	1

Panel C: Bond Characteristics

	Obs.	Mean	Median	Std. Dev.	Min.	Max.
Offering Amt (\$mil)	638	180	150	200	1	2,415
Maturity (months)	638	194	144	118	12	721
Callable	638	0.36		0.48	0	1
Putable	638	0.05		0.22	0	1
Private Placement	638	0.09		0.29	0	1
Convertible	638	0.10		0.30	0	1

Table 1: Summary Statistics (continued)**Panel D: Industry Distribution (Fama–French 12 Industry Groups)**

	Firm-Year observations		Bond observations	
	Freq	Pct	Freq	Pct
Consumer NonDurables	31	9.37	40	6.27
Consumer Durables	18	5.44	25	3.92
Manufacturing	75	22.66	111	17.4
Energy	16	4.83	29	4.55
Chemicals and Allied Products	25	7.55	36	5.64
Business Equipment	20	6.04	32	5.02
Telecommunication	23	6.95	34	5.33
Utilities	34	10.27	105	16.46
Shops	42	12.69	63	9.87
Health	14	4.23	17	2.66
Money	0	0	0	0
Other	33	9.97	146	22.88
Total	331	100.00	638	100.00

Table 2: Covenant Restrictions Tests - Post-Longholder

This table provides results examining the relation between realized CEO overconfidence (Post-Longholder) and the probability of getting covenant restrictions. The dependent variables are indicator variables that equal 1 if the bond contract consists of related restrictions, 0 otherwise. *All Investment* includes merger restrictions, asset disposition restrictions, indirect investment restrictions, secured, stock sale restrictions and direct investment restrictions. Asset sale disposition restrictions include restrictions on sale of assets, asset sale clause and sale and transfer of assets to unrestricted subsidiaries. Indirect investment restrictions contain restrictions on transactions with subsidiaries, fixed charge coverage, maintenance of minimum net worth, restrictions on redesignating subsidiaries, subsidiary fixed charge coverage and after acquired property clause. *Investment (Excluding M&A)* excludes merger restrictions from *All Investment*. *Merger & Acquisition* includes consolidation and merger restriction. We consider covenants from both parent company and subsidiaries. *Longholder* is an indicator variable that equals 1 if the CEO at some point during his tenure held an option until the last year before expiration and the option was at least 40% in-the-money entering that year, 0 otherwise. *Post-Longholder* is an indicator variable equal to 1 for CEO-years after the CEO for the first time holds options to expiration. *Holder 67* is an indicator variable that equals to 1 for all CEO years after the CEO for the first time fails to exercise a 67% in-the-money option with five years remaining duration, 0 otherwise. *CEO Power* is an indicator variable that takes the value of one if the CEO is also Chairman of the Board and President, 0 otherwise. *Stock Ownership* is the number of company stock owned by the CEO and his immediate family divided by the total common shares outstanding. *Vested Option* is the number of option holdings that are vested within six months divided by total common shares outstanding. *Concentration* is log of (bond offering amount/total assets). *Maturity* is the maturity period (in months) of public bond. *Callable* is a dummy variable that equals 1 if the bond has call feature, 0 otherwise. *Puttable* is a dummy variable that equals 1 if the bond has put feature, 0 otherwise. *Private Placement* is an indicator variable that equals 1 if the bond is rule-144a, 0 otherwise. *Convertible* is a dummy variable that equals 1 if the bond is convertible, 0 otherwise. *Profit* is net income divided by total assets. *Leverage* is long-term debt divided by total assets. *Size* is Log of total assets. *Tangibility* is net PP&E divided by total assets. *Market-to-Book* is book value of debt plus market value of equity divided by total assets. *Z-Score* is an indicator variable that equals to 1 if Z-Score is above 1.8 according to Altman (1968), 0 otherwise. *Past Capex and R&D* is the past 3 year average capital expenditure and R&D expenditure of the firm. *Past M&A* is the past 3 year average M&A expenditure of the firm. *Past Investment* includes both *Past Capex and R&D*, and *Past M&A*. *Past Net Debt Issuance* is the past 3 year average net debt issuance of the firm. *Industry Effects* is the Fama–French 12 Industry Groups, which is defined by Professor Kenneth French at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. z statistics are in parentheses and are adjusted for within cluster correlation by both firm and year. *, ** and *** indicate significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Table 2 Panel A: Covenant Restrictions Tests - Post-Longholder

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Post-Longholder	1.401 ^{***}	(3.08)	0.928 ^{**}	(2.03)	1.389 ^{***}	(3.23)
CEO Power	0.598 ^{***}	(4.35)	0.551 ^{***}	(3.90)	0.920 ^{***}	(2.98)
Stock Ownership	-0.214	(-0.12)	-0.436	(-0.25)	-0.935	(-0.63)
Vested Options	-0.556	(-0.51)	-0.369	(-0.31)	0.344	(0.22)
Concentration	-0.217	(-1.24)	-0.228	(-1.35)	-0.011	(-0.83)
Maturity	0.000	(0.24)	0.000	(0.50)	-0.000	(-0.05)
Callable	-0.608 ^{**}	(-2.48)	-0.600 ^{**}	(-2.47)	-0.615 ^{**}	(-2.32)
Puttable	0.566 ^{**}	(2.13)	0.397	(1.11)	0.777 ^{**}	(2.06)
Private Placement	-0.150	(-0.13)	-0.088	(-0.08)	0.539	(0.83)
Convertible	0.499 [*]	(1.65)	0.479	(1.55)	0.363	(0.98)
Profit	-1.522	(-0.90)	-1.563	(-0.97)	-2.257	(-1.15)
Leverage	2.495 ^{**}	(2.26)	2.098 [*]	(1.88)	2.426 ^{**}	(2.09)
Size	-0.116	(-0.67)	-0.145	(-0.89)	-0.005	(-0.05)
Tangibility	-0.430	(-0.82)	-0.080	(-0.15)	-1.460 ^{***}	(-2.72)
Market-to-Book	0.225	(1.29)	0.291 [*]	(1.77)	0.195	(0.90)
Z-Score	0.097	(0.42)	0.123	(0.53)	-0.432 [*]	(-1.75)
Past Investment	-0.326	(-0.19)				
Past Capex and R&D			-2.277	(-1.18)		
Past M&A					6.351	(1.56)
Constant	2.406	(1.08)	2.713	(1.27)	0.878	(0.79)
Industry Effects	Yes		Yes		Yes	
Observations	638		638		638	

Table 2 Panel B: Covenant Restrictions Tests - Holder 67

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Holder67	0.734 ^{***}	(2.98)	0.690 ^{***}	(2.66)	1.031 ^{***}	(4.09)
CEO Power	0.934 ^{***}	(3.44)	0.863 ^{***}	(2.63)	0.927 ^{***}	(3.08)
Stock Ownership	-1.865	(-0.80)	-2.590	(-0.96)	-0.777	(-0.29)
Vested Options	-2.882 [*]	(-1.92)	-3.391 ^{***}	(-3.25)	-3.650 ^{**}	(-2.24)
Concentration	-0.071	(-0.54)	-0.108	(-0.81)	0.015	(.)
Maturity	0.001	(0.64)	0.001	(0.68)	0.000	(0.22)
Callable	-0.999 ^{***}	(-3.36)	-0.891 ^{***}	(-3.32)	-0.754 ^{***}	(-2.70)
Puttable	0.440	(1.30)	0.171	(0.40)	0.624	(1.60)
Convertible	0.832 [*]	(1.75)	0.465	(0.98)	0.946 ^{**}	(2.18)
Profit	-8.077 ^{***}	(-3.03)	-6.634 ^{***}	(-2.70)	-9.463 ^{***}	(-2.82)
Leverage	3.013	(1.43)	3.582	(1.63)	2.488	(1.43)
Size	-0.045	(-0.21)	-0.182	(-0.80)	0.143	(0.65)
Tangibility	-1.586 [*]	(-1.82)	-1.367	(-1.55)	-1.728	(-1.60)
Market-to-Book	0.454	(1.27)	0.506	(1.42)	0.507	(1.33)
Z-Score	-0.279	(-0.56)	-0.290	(-0.57)	-0.256	(-0.51)
Past Investment	3.375	(1.21)				
Past Capex and R&D			3.322	(0.94)		
Past M&A					3.920	(1.24)
Constant	1.146	(0.49)	2.091	(0.82)	-0.357	(-0.18)
Industry Effects	Yes		Yes		Yes	
Observations	278		278		278	

Table 3: Covenant Restrictions Tests - Pre- and Post-Longholder

This table provides results examining the effect of both ex-ante CEO overconfidence (Pre-Longholder) and realized CEO overconfidence (Post-Longholder) on the probability of getting covenant restrictions. The dependent variables are indicator variables that equal 1 if the bond contract consists of related restrictions, 0 otherwise. *All Investment* includes merger restrictions, asset disposition restrictions, indirect investment restrictions, secured, stock sale restrictions and direct investment restrictions. Asset sale disposition restrictions include restrictions on sale of assets, asset sale clause and sale and transfer of assets to unrestricted subsidiaries. Indirect investment restrictions contain restrictions on transactions with subsidiaries, fixed charge coverage, maintenance of minimum net worth, restrictions on redesignating subsidiaries, subsidiary fixed charge coverage and after acquired property clause. *Investment (Excluding M&A)* excludes merger restrictions from *All Investment*. *Merger & Acquisition* includes consolidation and merger restriction. We consider covenants from both parent company and subsidiaries. *Longholder* is an indicator variable that equals 1 if the CEO at some point during his tenure held an option until the last year before expiration and the option was at least 40% in-the-money entering that year, 0 otherwise. *Post-Longholder* is an indicator variable equal to 1 for CEO-years after the CEO for the first time holds options to expiration. *Pre-Longholder* is an indicator variable equal to 1 for CEO-years that are classified as 1 under *Longholder*, but 0 under *Post-Longholder*. *CEO Power* is an indicator variable that takes the value of one if the CEO is also Chairman of the Board and President, 0 otherwise. *Stock Ownership* is the number of company stock owned by the CEO and his immediate family divided by the total common shares outstanding. *Vested Option* is the number of option holdings that are vested within six months divided by total common shares outstanding. *Concentration* is log of (bond offering amount/total assets). *Maturity* is the maturity period (in months) of public bond. *Callable* is a dummy variable that equals 1 if the bond has call feature, 0 otherwise. *Puttable* is a dummy variable that equals 1 if the bond has put feature, 0 otherwise. *Private Placement* is an indicator variable that equals 1 if the bond is rule-144a, 0 otherwise. *Convertible* is a dummy variable that equals 1 if the bond is convertible, 0 otherwise. *Profit* is net income divided by total assets. *Leverage* is long-term debt divided by total assets. *Size* is Log of total assets. *Tangibility* is net PP&E divided by total assets. *Market-to-Book* is book value of debt plus market value of equity divided by total assets. *Z-Score* is an indicator variable that equals to 1 if Z-Score is above 1.8 according to Altman (1968), 0 otherwise. *Past Capex and R&D* is the past 3 year average capital expenditure and R&D expenditure of the firm. *Past M&A* is the past 3 year average M&A expenditure of the firm. *Past Investment* includes both *Past Capex and R&D*, and *Past M&A*. *Past Net Debt Issuance* is the past 3 year average net debt issuance of the firm. *Industry Effects* is the Fama–French 12 Industry Groups, which is defined by Professor Kenneth French at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. z statistics are in parentheses and are adjusted for within cluster correlation by both firm and year. *, ** and *** indicate significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Table 3: Covenant Restrictions Tests - Pre- and Post-Longholder (continued)

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Pre-Longholder	0.550 ^{**}	(2.49)	0.560 ^{**}	(2.56)	0.608 ^{***}	(2.82)
Post-Longholder	1.511 ^{***}	(3.12)	1.022 ^{**}	(2.25)	1.505 ^{***}	(3.33)
CEO Power	0.594 ^{***}	(4.13)	0.551 ^{***}	(3.83)	0.921 ^{***}	(2.89)
Stock Ownership	-0.120	(-0.06)	-0.346	(-0.20)	-0.928	(-0.66)
Vested Options	-1.626	(-1.27)	-1.443	(-1.12)	-1.230	(-0.77)
Concentration	-0.218	(-1.25)	-0.231	(-1.37)	-0.012	(-0.92)
Maturity	0.000	(0.18)	0.000	(0.43)	-0.000	(-0.12)
Callable	-0.614 ^{**}	(-2.52)	-0.609 ^{**}	(-2.51)	-0.624 ^{**}	(-2.31)
Putable	0.581 ^{**}	(2.41)	0.416	(1.21)	0.808 ^{**}	(2.33)
Private Placement	-0.130	(-0.12)	-0.084	(-0.08)	0.560	(0.86)
Convertible	0.509 [*]	(1.67)	0.489	(1.59)	0.368	(0.99)
Profit	-1.494	(-0.91)	-1.537	(-0.97)	-2.206	(-1.16)
Leverage	2.538 ^{**}	(2.32)	2.145 ^{**}	(1.98)	2.550 ^{**}	(2.24)
Size	-0.123	(-0.71)	-0.154	(-0.94)	-0.019	(-0.17)
Tangibility	-0.452	(-0.84)	-0.109	(-0.21)	-1.545 ^{***}	(-2.73)
Market-to-Book	0.254	(1.43)	0.318 [*]	(1.89)	0.229	(1.03)
Z-Score	0.130	(0.55)	0.157	(0.67)	-0.401	(-1.63)
Past Investment	-0.502	(-0.30)				
Past Capex and R&D			-2.334	(-1.27)		
Past M&A					6.030	(1.51)
Constant	2.418	(1.09)	2.743	(1.29)	0.911	(0.83)
Industry Effects	Yes		Yes		Yes	
Observations	638		638		638	

Table 3: Covenant Restrictions Tests - Pre- and Post-Longholder (continued)

	(1) All Investment	(2) Investment (Excluding M&A)	(3) Merger & Acquisition
F-Test (p-Value): Pre-Longholder = Post-Longholder	0.053	0.373	0.039

Table 4: Information Transparency Tests

This table provides results examining the relation between CEO overconfidence, information quality, and the probability of getting covenant restrictions. The dependent variables are indicator variables that equal 1 if the bond contract consists of related restrictions, 0 otherwise. *All Investment* includes merger restrictions, asset disposition restrictions, indirect investment restrictions, secured, stock sale restrictions and direct investment restrictions. Asset sale disposition restrictions include restrictions on sale of assets, asset sale clause and sale and transfer of assets to unrestricted subsidiaries. Indirect investment restrictions contain restrictions on transactions with subsidiaries, fixed charge coverage, maintenance of minimum net worth, restrictions on redesignating subsidiaries, subsidiary fixed charge coverage and after acquired property clause. *Investment (Excluding M&A)* excludes merger restrictions from *All Investment*. *Merger & Acquisition* includes consolidation and merger restriction. We consider covenants from both parent company and subsidiaries. *Longholder* is an indicator variable that equals 1 if the CEO at some point during his tenure held an option until the last year before expiration and the option was at least 40% in-the-money entering that year, 0 otherwise. *Post-Longholder* is an indicator variable equal to 1 for CEO-years after the CEO for the first time holds options to expiration. *Pre-Longholder* is an indicator variable equal to 1 for CEO-years that are classified as 1 under *Longholder*, but 0 under *Post-Longholder*. *Abnormal Accruals* is the accounting quality measure estimated by the modified Jones model. *ROA* is the past 3 year average ROA of the firm. *CEO Power* is an indicator variable that takes the value of one if the CEO is also Chairman of the Board and President, 0 otherwise. *Stock Ownership* is the number of company stock owned by the CEO and his immediate family divided by the total common shares outstanding. *Vested Option* is the number of option holdings that are vested within six months divided by total common shares outstanding. *Concentration* is log of (bond offering amount/total assets). *Maturity* is the maturity period (in months) of public bond. *Callable* is a dummy variable that equals 1 if the bond has call feature, 0 otherwise. *Puttable* is a dummy variable that equals 1 if the bond has put feature, 0 otherwise. *Private Placement* is an indicator variable that equals 1 if the bond is rule-144a, 0 otherwise. *Convertible* is a dummy variable that equals 1 if the bond is convertible, 0 otherwise. *Profit* is net income divided by total assets. *Leverage* is long-term debt divided by total assets. *Size* is Log of total assets. *Tangibility* is net PP&E divided by total assets. *Market-to-Book* is book value of debt plus market value of equity divided by total assets. *Z-Score* is an indicator variable that equals to 1 if Z-Score is above 1.8 according to Altman (1968), 0 otherwise. *Past Capex and R&D* is the past 3 year average capital expenditure and R&D expenditure of the firm. *Past M&A* is the past 3 year average M&A expenditure of the firm. *Past Investment* includes both *Past Capex and R&D*, and *Past M&A*. *Past Net Debt Issuance* is the past 3 year average net debt issuance of the firm. *Industry Effects* is the Fama–French 12 Industry Groups, which is defined by Professor Kenneth French at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. z statistics are in parentheses and are adjusted for within cluster correlation by both firm and year. *, ** and *** indicate significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Table 4 Panel A: Information Transparency Tests - Abnormal Accruals

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Post-Longholder	0.793*	(1.85)	-0.068	(-0.15)	1.115***	(2.80)
Post-Longholder*Abnormal Accruals	13.566**	(2.06)	31.380***	(3.03)	6.899	(1.38)
CEO Power	0.595***	(4.15)	0.568***	(3.81)	0.905***	(2.88)
Stock Ownership	-0.333	(-0.18)	-0.505	(-0.28)	-1.080	(-0.74)
Vested Options	-0.656	(-0.57)	-0.561	(-0.44)	0.734	(0.41)
Concentration	-0.226	(-1.29)	-0.250	(-1.47)	-0.012	(-0.86)
Maturity	0.000	(0.16)	0.000	(0.42)	-0.000	(-0.09)
Callable	-0.605**	(-2.44)	-0.592**	(-2.43)	-0.623**	(-2.26)
Putable	0.613**	(2.57)	0.449	(1.36)	0.840**	(2.18)
Private Placement	-0.224	(-0.20)	-0.216	(-0.20)	0.506	(0.76)
Convertible	0.561*	(1.77)	0.554*	(1.74)	0.435	(1.15)
Profit	-1.203	(-0.72)	-1.218	(-0.73)	-1.819	(-1.02)
Leverage	2.504**	(2.38)	2.204**	(1.97)	2.534**	(2.29)
Size	-0.140	(-0.79)	-0.171	(-1.03)	-0.021	(-0.19)
Tangibility	-0.382	(-0.74)	-0.044	(-0.08)	-1.384***	(-2.64)
Market-to-Book	0.189	(1.10)	0.257	(1.57)	0.158	(0.76)
Z-Score	0.059	(0.25)	0.087	(0.38)	-0.492*	(-1.76)
Abnormal Accruals	0.294	(0.91)	0.323	(0.88)	0.313	(0.95)
Past Investment	0.048	(0.03)				
Past Capex and R&D			-1.702	(-0.83)		
Past M&A					5.922	(1.42)
Constant	2.592	(1.15)	2.913	(1.35)	0.967	(0.87)
Industry Effects	Yes		Yes		Yes	
Observations	628		628		628	

Table 4 Panel B: Information Transparency Tests - Growth Opportunities

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Post-Longholder	4.605 ^{***}	(4.30)	2.067	(1.39)	4.643 ^{***}	(4.25)
Post-Longholder*Market-to-Book	-1.486 ^{***}	(-2.86)	-0.702	(-1.05)	-1.466 ^{***}	(-2.61)
CEO Power	0.575 ^{***}	(4.23)	0.529 ^{***}	(3.96)	0.907 ^{***}	(2.88)
Stock Ownership	-0.343	(-0.18)	-0.551	(-0.31)	-1.053	(-0.69)
Vested Options	-0.627	(-0.53)	-0.430	(-0.35)	0.628	(0.34)
Concentration	-0.216	(-1.23)	-0.225	(-1.33)	-0.011	(-0.87)
Maturity	0.000	(0.24)	0.000	(0.55)	-0.000	(-0.05)
Callable	-0.600 ^{**}	(-2.42)	-0.597 ^{**}	(-2.45)	-0.614 ^{**}	(-2.29)
Putable	0.570 ^{**}	(2.13)	0.388	(1.07)	0.783 ^{**}	(2.05)
Private Placement	-0.144	(-0.13)	-0.088	(-0.08)	0.524	(0.80)
Convertible	0.542 [*]	(1.81)	0.503	(1.62)	0.398	(1.07)
Profit	-1.150	(-0.64)	-1.257	(-0.74)	-1.964	(-0.95)
Leverage	2.397 ^{**}	(2.12)	2.029 [*]	(1.85)	2.383 ^{**}	(2.05)
Size	-0.118	(-0.66)	-0.148	(-0.89)	-0.005	(-0.05)
Tangibility	-0.424	(-0.79)	-0.088	(-0.17)	-1.502 ^{***}	(-2.76)
Market-to-Book	0.286	(1.47)	0.333 [*]	(1.91)	0.243	(1.05)
Z-Score	0.138	(0.59)	0.157	(0.68)	-0.412	(-1.62)
Past Investment	-0.609	(-0.38)				
Past Capex and R&D			-2.380	(-1.26)		
Past M&A					6.193	(1.51)
Constant	2.449	(1.08)	2.740	(1.27)	0.900	(0.80)
Industry Effects	Yes		Yes		Yes	
Observations	638		638		638	

Table 4 Panel C: Information Transparency Tests - ROA

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Post-Longholder	3.923 ^{***}	(3.21)	1.571	(1.42)	3.744 ^{***}	(3.14)
Post-Longholder*ROA	-25.887 ^{**}	(-2.30)	-8.670	(-0.89)	-24.716 ^{**}	(-2.19)
CEO Power	0.604 ^{***}	(4.11)	0.565 ^{***}	(3.69)	0.905 ^{***}	(2.95)
Stock Ownership	-0.247	(-0.13)	-0.431	(-0.24)	-0.994	(-0.66)
Vested Options	-0.399	(-0.31)	-0.168	(-0.13)	0.385	(0.24)
Concentration	-0.216	(-1.21)	-0.225	(-1.32)	-0.012	(-0.91)
Maturity	0.000	(0.16)	0.000	(0.41)	-0.000	(-0.05)
Callable	-0.606 ^{**}	(-2.35)	-0.602 ^{**}	(-2.39)	-0.628 ^{**}	(-2.34)
Putable	0.564 ^{**}	(2.11)	0.378	(1.04)	0.726 ^{**}	(2.04)
Private Placement	-0.162	(-0.14)	-0.131	(-0.12)	0.512	(0.76)
Convertible	0.566 [*]	(1.80)	0.516	(1.62)	0.412	(1.11)
Leverage	2.554 ^{**}	(2.49)	2.213 ^{**}	(2.20)	2.569 ^{**}	(2.38)
Size	-0.113	(-0.64)	-0.145	(-0.88)	-0.007	(-0.07)
Tangibility	-0.581	(-1.04)	-0.266	(-0.48)	-1.644 ^{***}	(-2.79)
Market-to-Book	0.179	(0.88)	0.198	(1.04)	0.140	(0.63)
Z_Dum	0.219	(0.88)	0.231	(0.91)	-0.320	(-1.29)
ROA	2.106	(1.27)	2.012	(1.09)	1.305	(0.72)
Past Investment	-0.499	(-0.31)				
Past Capex and R&D			-1.943	(-1.03)		
Past M&A					5.569	(1.34)
Constant	2.310	(1.01)	2.638	(1.23)	0.876	(0.78)
Industry Effects	Yes		Yes		Yes	
Observations	638		638		638	

Table 5: Cost of Debt Tests

This table provides results examining the relation between CEO overconfidence and the cost of debt (*Treasury Spread*). The dependent variable is *Treasury Spread*, which is the difference between the yield of the benchmark treasury issue and the issue's offering yield expressed in basis points. *All Investment* includes merger restrictions, asset disposition restrictions, indirect investment restrictions, secured, stock sale restrictions and direct investment restrictions. Asset sale disposition restrictions include restrictions on sale of assets, asset sale clause and sale and transfer of assets to unrestricted subsidiaries. Indirect investment restrictions contain restrictions on transactions with subsidiaries, fixed charge coverage, maintenance of minimum net worth, restrictions on redesignating subsidiaries, subsidiary fixed charge coverage and after acquired property clause. We consider covenants from both parent company and subsidiaries. *Longholder* is an indicator variable that equals 1 if the CEO at some point during his tenure held an option until the last year before expiration and the option was at least 40% in-the-money entering that year, 0 otherwise. *Post-Longholder* is an indicator variable equal to 1 for CEO-years after the CEO for the first time holds options to expiration. *CEO Power* is an indicator variable that takes the value of one if the CEO is also Chairman of the Board and President, 0 otherwise. *Stock Ownership* is the number of company stock owned by the CEO and his immediate family divided by the total common shares outstanding. *Vested Option* is the number of option holdings that are vested within six months divided by total common shares outstanding. *Concentration* is log of (bond offering amount/total assets). *Maturity* is the maturity period (in months) of public bond. *Callable* is a dummy variable that equals 1 if the bond has call feature, 0 otherwise. *Puttable* is a dummy variable that equals 1 if the bond has put feature, 0 otherwise. *Credit Spread* is the difference of Moody's Seasoned Corporate Bond Yields between BAA and AAA. *Private Placement* is an indicator variable that equals 1 if the bond is rule-144a, 0 otherwise. *Convertible* is a dummy variable that equals 1 if the bond is convertible, 0 otherwise. *Profit* is net income divided by total assets. *Leverage* is long-term debt divided by total assets. *Size* is Log of total assets. *Tangibility* is net PP&E divided by total assets. *Market-to-Book* is book value of debt plus market value of equity divided by total assets. *Z-Score* is an indicator variable that equals to 1 if Z-Score is above 1.8 according to Altman (1968), 0 otherwise. *Past Capex and R&D* is the past 3 year average capital expenditure and R&D expenditure of the firm. *Past M&A* is the past 3 year average M&A expenditure of the firm. *Past Investment* includes both *Past Capex and R&D*, and *Past M&A*. *Past Net Debt Issuance* is the past 3 year average net debt issuance of the firm. *Industry Effects* is the Fama–French 12 Industry Groups, which is defined by Professor Kenneth French at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. t statistics are in parentheses. For model (1), they are adjusted for within cluster correlation by both firm and year. For model (2), they are adjusted for cross-equation correlation. *, ** and *** indicate significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Table 5: Cost of Debt Tests (continued)

	(1) OLS Model		(2) SURE Model	
Post-Longholder	57.665 ^{***}	(2.71)	57.665	(1.07)
Post-Longholder*Investment Restriction	-54.543 ^{**}	(-2.52)	-54.543	(-0.99)
CEO Power	-1.688	(-0.23)	-1.688	(-0.33)
Stock Ownership	88.387 [*]	(1.84)	88.387 [*]	(1.71)
Vested Options	50.189	(1.48)	50.189	(1.06)
Concentration	5.113 [*]	(1.95)	5.113 [*]	(1.82)
Maturity	0.136 ^{***}	(6.77)	0.136 ^{***}	(6.45)
Callable	-55.983 ^{***}	(-5.61)	-55.983 ^{***}	(-8.97)
Putable	-43.846 ^{***}	(-5.86)	-43.846 ^{***}	(-4.01)
Credit Spread	-24.237 [*]	(-1.74)	-24.237 ^{***}	(-2.80)
Private Placement	29.135	(1.46)	29.135	(0.55)
Convertible	-26.429 ^{**}	(-2.03)	-26.429 ^{***}	(-2.86)
Profit	111.841	(1.39)	111.841 ^{**}	(2.48)
Leverage	67.514 [*]	(1.92)	67.514 ^{***}	(2.73)
Size	5.071	(1.05)	5.071	(1.47)
Tangibility	-65.014 ^{***}	(-3.72)	-65.014 ^{***}	(-3.76)
Market-to-Book	-18.699 ^{***}	(-3.64)	-18.699 ^{***}	(-3.36)
Z-Score	41.598 ^{***}	(3.45)	41.598 ^{***}	(6.12)
Past Investment	200.868 ^{***}	(5.54)	200.868 ^{***}	(3.94)
Past Net Debt Issuance	-129.899 ^{***}	(-7.58)	-129.899 ^{**}	(-2.15)
Investment Restrictions	28.950 ^{***}	(3.80)	28.950 ^{***}	(3.95)
Constant	-1.376	(-0.02)	-1.376	(-0.03)
Industry Effects	Yes		Yes	
Observations	524		524	

Table 6: Subsequent Financing Tests

This table provides results examining the effect of subsequent financing restriction on overconfident CEO. The dependent variable is *Subsequent Financing*, which includes restrictions on subordinate debt issuance, restrictions on sale and lease obligations, restrictions on debt priority and stock issuance restrictions. Subordinate debt issuance restrictions include subordinate debt issuance, net earnings test, leverage test, subsidiary borrowings, subsidiary guarantees, subsidiary leverage test and negative pledge covenant. Restrictions on debt priority include restrictions on funded debt, indebtedness, liens and, senior debt issuance of parent company and subsidiaries. Stock issuance restrictions include restrictions on issuance of stock and, preference stock of parent company and subsidiaries. We consider covenants from both parent company and subsidiaries. *Longholder* is an indicator variable that equals 1 if the CEO at some point during his tenure held an option until the last year before expiration and the option was at least 40% in-the-money entering that year, 0 otherwise. *Post-Longholder* is an indicator variable equal to 1 for CEO-years after the CEO for the first time holds options to expiration. *Pre-Longholder* is an indicator variable equal to 1 for CEO-years that are classified as 1 under *Longholder*, but 0 under *Post-Longholder*. *Holder 67* is an indicator variable that equals to 1 for all CEO years after the CEO for the first time fails to exercise a 67% in-the-money option with five years remaining duration, 0 otherwise. *Abnormal Accruals* is the accounting quality measure estimated by the modified Jones model. *ROA* is the past 3 year average ROA of the firm. *CEO Power* is an indicator variable that takes the value of one if the CEO is also Chairman of the Board and President, 0 otherwise. *Stock Ownership* is the number of company stock owned by the CEO and his immediate family divided by the total common shares outstanding. *Vested Option* is the number of option holdings that are vested within six months divided by total common shares outstanding. *Concentration* is log of (bond offering amount/total assets). *Maturity* is the maturity period (in months) of public bond. *Callable* is a dummy variable that equals 1 if the bond has call feature, 0 otherwise. *Puttable* is a dummy variable that equals 1 if the bond has put feature, 0 otherwise. *Private Placement* is an indicator variable that equals 1 if the bond is rule-144a, 0 otherwise. *Convertible* is a dummy variable that equals 1 if the bond is convertible, 0 otherwise. *Profit* is net income divided by total assets. *Leverage* is long-term debt divided by total assets. *Size* is Log of total assets. *Tangibility* is net PP&E divided by total assets. *Market-to-Book* is book value of debt plus market value of equity divided by total assets. *Z-Score* is an indicator variable that equals to 1 if Z-Score is above 1.8 according to Altman (1968), 0 otherwise. *Past Capex and R&D* is the past 3 year average capital expenditure and R&D expenditure of the firm. *Past M&A* is the past 3 year average M&A expenditure of the firm. *Past Investment* includes both *Past Capex and R&D*, and *Past M&A*. *Past Net Debt Issuance* is the past 3 year average net debt issuance of the firm. *Industry Effects* is the Fama–French 12 Industry Groups, which is defined by Professor Kenneth French at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. z statistics are in parentheses and are adjusted for within cluster correlation by both firm and year. *, ** and *** indicate significance at two-tailed probability levels of 10%, 5%, and 1%, respectively.

Table 6: Subsequent Financing Tests (continued)

	(1) Post-Longholder		(2) Pre- Post- Longholder		(3) Holder 67	
Post-Longholder	1.234 ^{***}	(5.01)	1.267 ^{***}	(4.49)		
Pre-Longholder			0.198	(0.48)		
Holder67					0.597 ^{**}	(2.18)
CEO Power	-0.481 [*]	(-1.66)	-0.482 [*]	(-1.66)	0.016	(0.03)
Stock Ownership	-2.510 [*]	(-1.84)	-2.544 ^{**}	(-2.01)	3.097	(1.01)
Vested Options	-2.942	(-1.39)	-3.441 [*]	(-1.86)	-5.054 ^{**}	(-2.16)
Concentration	0.064	(1.39)	0.063	(1.38)	0.101 ^{***}	(7.24)
Maturity	-0.000	(-0.16)	-0.000	(-0.17)	0.001	(1.10)
Callable	-0.393 [*]	(-1.65)	-0.397 [*]	(-1.65)	-0.811 ^{***}	(-2.67)
Putable	-0.207	(-0.52)	-0.210	(-0.53)	-1.057	(-1.18)
Convertible	-2.415 ^{***}	(-6.11)	-2.403 ^{***}	(-6.13)		
Profit	-1.655	(-1.01)	-1.664	(-1.02)	0.664	(0.32)
Leverage	1.865 [*]	(1.93)	1.881 [*]	(1.93)	3.553 [*]	(1.87)
Size	0.269 [*]	(1.78)	0.262 [*]	(1.74)	0.584 ^{***}	(3.06)
Tangibility	-0.301	(-0.38)	-0.343	(-0.43)	-0.197	(-0.21)
Market-to-Book	0.700 ^{***}	(3.01)	0.700 ^{***}	(3.02)	1.902 ^{***}	(3.32)
Z-Score	0.096	(0.22)	0.105	(0.24)	-1.247 [*]	(-1.90)
Past Net Debt Issuance	-3.837	(-1.64)	-3.849	(-1.64)	-9.772 [*]	(-1.81)
Constant	-1.800	(-1.08)	-1.739	(-1.06)	-8.494 ^{***}	(-4.80)
Industry Effects	Yes		Yes		Yes	
Observations	549		549		210	