The Role of Managerial Overconfidence in the Design of Debt Covenants

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Abstract

We examine the influence of behavioral characteristics on the design of debt covenants. We find that firms with overconfident CEOs face tighter restrictions on their ability to make future investments, acquisitions, and raise additional debt financing. These restrictions are partially mitigated when firms with overconfident CEOs have greater information transparency, a better performance record, and investment opportunities. Interestingly, we find only weak evidence for the effects on cost of debt. Overall, our study highlights the role of debt covenants in mitigating the effects of behavioral characteristics incremental to other firm and CEO specific factors documented in the prior literature.

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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] 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 however suggests that such an assumption is not valid and individuals tend to maintain overconfident beliefs. 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 and value-destroying acquisitions (Malmendier and Tate, 2008).

Despite the growing evidence on the effects of managerial overconfidence on corporate decisions, it is unclear whether investors incorporate such overconfidence in contracting with firms with overconfident CEOs. This study sheds light on this issue 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 debt covenants when faced with overconfident managers accessing public debt markets for financing?

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 (2005) 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

[1] The basis for this stream of literature is the evidence that individual beliefs are not always rational and decisions based on these beliefs are not always consistent (see Kahneman and Tversky, 2000 and Gilovich, Griffin, and Kahneman, 2002).

whether the overconfident managers face higher borrowing costs. Finally, we examine if bondholders place covenant restrictions on their ability to raise subsequent financing which indirectly limits investment and acquisition activities.

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 (2007), "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". Therefore, they highlight the importance of distinguishing implications of overconfidence from the traditional agency problems in empirical studies. We address this challenge by using overconfidence measures that are unrelated to moral hazard problems and we also control for managerial entrenchment in all empirical tests. We discuss this in detail in the following paragraphs.

We follow the "revealed beliefs" approach used by Malmendier and Tate (2005) to capture CEOs' expectations with respect to future returns of their firms.[2] CEO overconfidence is 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. Assuming reasonable levels of risk aversion and CEO wealth concentration in the firm, Hall and Murphy (2002) calibrate a utility model to generate the exercise thresholds in terms of in-the-moneyness of the option over the life of the option. Our measures of overconfidence classify CEOs as overconfident if they continue to hold their fully vested options well beyond the threshold (see Appendix 1A for a detailed discussion of the variable construction). The idea is that since the CEO's wealth and human capital is already exposed to

[2] There are two alternative approaches to infer managerial beliefs of overconfidence that are used in the extant 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" which relies on third-party perceptions of the manager's beliefs as reflected in the use of certain keywords related to overconfidence in the business press (Malmendier and Tate, 2005). The disadvantage of this approach is that it captures to a certain extent the bias of the business writer in describing the managerial attitudes as well as potential differences in investor relation activities by the firm and therefore we do not use this approach.

firm specific risk they should exercise their in-the-money options earlier than a diversified holder (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 managers' revealed overconfident beliefs.

We examine the relation between CEO overconfidence and bond covenants that place restrictions on investments and acquisitions. If bondholders recognize that organic (capital expenditures) and inorganic (acquisitions) investment decisions of overconfident managers are potentially value-destroying, we should observe more restrictive covenants for such firms. We focus on three covenant groups: investment, merger, and subsequent financing covenants following the classification in Smith and Warner (1979) and Chava, Kumar, and Warga (2009), and.[3] 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 7.4 percentage points for all investment restrictions, 7.1 percentage points for investment restrictions excluding mergers, and 15.8 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 robustness tests, we also show that the effects are driven by CEO characteristics and not unobserved firm effects.

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 manager-bondholder agency conflicts arising due to entrenchment using restrictive covenants. 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 significantly associated with higher level of merger and investment

[3] We do not examine the quantitative restrictions that lenders may impose by way of covenant thresholds on financial ratios. The use of such specific benchmarks in public debt contracts is less common and has been decreasing over time since it imposes higher monitoring costs. Such thresholds are more common in private debt contracts where the bank has the willingness and ability to require detailed information from the firm on a timely basis (usually monthly) that is subject to analysis and scrutiny by the loan officer. However the bank loan data is not available for the time period for which we have the overconfidence measures.

restrictions. Thus the effects of CEO overconfidence in debt contracting are incremental to managerial agency problems traditionally studied.

We then examine if there are mechanisms that mitigate the need for restrictive covenants. When the overconfident CEO has demonstrated superior prior performance, a willingness to provide transparent financial information and the firm faces high growth opportunities, the prospect of value-destroying investments is lower and we expect fewer restrictive covenants. We find that 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 greater information transparency, higher investment opportunities and higher delivered profitability.

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. In an OLS specification, we find that overconfident CEOs face higher cost of debt, and investment related restrictions help to mitigate this cost. However, when we model the cost of debt and covenant restrictions jointly in the SURE model, we fail to find consistent evidence that firms with overconfident managers face higher interest costs. The weak evidence on cost of debt 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 future 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 investment restrictions and indirectly through financing restrictions. Yet, they do not appear to consistently increase the interest cost of debt.

There are some alternative explanations for our results, largely stemming from the interpretation of our overconfidence measure. One alternative explanation for undiversified option holdings by managers is that managers may possess favorable private information. However, in that case, bond investors would infer the good prospects from the managers' portfolio decision and we would expect better terms for borrowing and not adverse terms as predicted by the overconfidence explanation. Further, Malmendier and Tate (2005) rule out the private information explanation by showing that managers would have earned higher returns by exercising in-the-money options rather than holding on to them. Another alternative explanation for why CEOs appear to delay exercise is that their risk preferences may be different from those assumed in Hall and Murphy (2002). If lenders infer the CEO's risk preferences rather than overconfident beliefs from the CEO portfolio holdings, it may predict similar restrictions on investments. We try to separate these two explanations by examining dividend restrictions. While overconfident managers avoid dividend payments to conserve cash for investments, the risk preference explanation does not predict systematic differences between overconfident and non overconfident managers with respect to dividend payments. We find that overconfident CEOs face significantly fewer dividend restrictions consistent with our construct measuring overconfident beliefs and not greater preferences for risk. We discuss these tests and other alternative explanations in Appendix 1B.[4] Finally, our use of a well established measure of overconfidence allows us to rely on extensive robustness tests conducted in Malmendier and Tate (2005) to support the overconfidence argument.[5]

Our paper contributes to three strands of literature. First, we contribute to a growing empirical literature on financial contracting (Roberts and Sufi, 2009) by offering an alternative motivation for the 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. However, unlike empire builders

[4] We recognize that CEO beliefs and their risk preferences are intrinsic to the CEO and unobservable and therefore our results are potentially driven by both of these managerial behavioral traits. However, taken together with the prior literature, our results are consistent with the overconfident beliefs of CEOs.

[5] 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.

who derive private benefits, overconfident CEOs may believe that they are acting in the interests of shareholders. Our evidence also compliments Landier and Thesmar (2009) who show that optimistic entrepreneurs get shorter maturity debt relative to realistic entrepreneurs.

Second, we extend the prior behavioral corporate finance literature that documents suboptimal investment and financial decisions of overconfident CEOs' by examining the contracting response of external parties to the CEO behavioral bias. Our evidence partly sheds light on an outstanding issue in the behavioral finance literature articulated in Subramanyam's (2007) survey: "a basic question that arises from the [behavioral corporate finance] literature is whether managers [are] dealing with an irrational market, or whether a rational market dealing with irrational managers, or both." 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 and thus, reduce 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. (2010). 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 I reviews the related literature and develops our hypotheses. Section II describes the data and variable measurement. Section III documents the empirical strategy and discusses the results. Section IV describes additional robustness analysis to support our empirics and results and Section V concludes.

I. 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 agency theory framework of bondholder-shareholder conflicts 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 influence of the specific manager in the firm's 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. 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. 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. In an influential series of studies Malmendier and Tate (2005, 2008) and Malmendier, Tate and Yan (2010) 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 overinvest in terms of capital expenditure, overpay and make value destroying acquisitions, exhibit strong capital pecking-order preferences, and exhibit debt conservatism. This is consistent with Baker, Ruback, and Wurgler (2007) 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 conflicts 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 lenders are 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. Greater information transparency makes it easier for lenders to monitor the investment policies of managers thus reducing the reliance on restrictive covenants. Bondholders trade off the risk associated with CEO overconfidence with the adverse effects of excessive monitoring. We therefore conjecture that information transparency would decrease 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 greater information transparency, higher realized profitability, and higher growth opportunities, (i) the relation between overconfident CEOs and investment related restrictions is weaker, and (ii) the relation between overconfident CEOs and consolidation and merger restrictions is weaker.*

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.*

Finally an alternative to restrictive covenants is for lenders to price the risk of contracting with overconfident CEOs and charge such firms a higher interest rate. We therefore examine whether overconfident CEOs face higher borrowing costs relative to firms without overconfident CEOs.

II. Data and Variable Measurement

A. 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)[6]. 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 final dataset for the inclusion of covenant restriction tests. It consists of 608 bonds with 311 firm-years.

[6] 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.

B. 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* is 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 initiation 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 that the CEO holds any of the options till expiration that are over 40 percent in the money. 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 the overconfident portfolio holding (i.e. periods prior to classification as *Post-Longholder*) using an indicator variable, *Pre-Longholder*. Since Post-Longholder imposes a requirement that the CEO demonstrate sustained overconfidence in his portfolio holding for a period of typically 5 years since vesting, we expect that lenders would begin to incorporate such a behavior in their contracts written in Pre-Longholder period. We therefore 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 that CEOs with options that are substantially in the money, as indicated by the Hall and Murphy (2002) threshold of 67 percent, at the time of vesting will sell them immediately. If these in-the-money options remain 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.

The *Holder 67* measure is restricted to all CEO years with options that have 5 year remaining duration (assuming that options vest by the end of four years for our sample) and are at least 67 percent in-the-money. This selection criterion ensures that all the CEOs considered had the opportunity to exhibit overconfidence with their in-the-money options. 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. The company issued five bonds before 1987 and it offered three more after Theodore Brophy exhibited overconfidence. The limitation of using the *Holder67* measure is that it reduces the sample size considerably to 257 bonds with 151 firm-years.

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 (see Appendix 1B for a discussion). 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.

C. 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.[7]

D. 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, measured at the time of bond issuance. Data on corporate bond yields is obtained from the Federal Reserve Bank website.

E. 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:

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

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

[7] 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.

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 information transparency is decreasing in the magnitude of *Abnormal Accruals*.

We measure the attractiveness of the investment opportunity set and the prior track record of profitability 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. Since we use industry fixed effects in all our specifications, these variables can be interpreted as industry adjusted measures.

F. 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 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 control for *Leverage*, measured as long term debt scaled by assets; *Size*, which is the log of assets, *Tangibility*; measured as net PPE scaled by assets, *Profit*, measured as net income scaled by assets, and *Market-to-Book* of 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 addition to the abovementioned firm characteristics, we further control for firm's past observable behaviors on the dimension that is sought to be restricted by the covenants. Billet and Qian (2005) find that the market's perception of merger quality worsens as the CEO engages in multiple acquisitions. Therefore, we control for the firm's past 3 year average M&A expenditure. Further, since there may be similar information in past investment and financing decisions, we control for the firm's prior 3 year average capital expenditures and R&D (*Past Capex and R&D)*,

and past 3 year average net debt issuance (*Past Net Debt Issuance*). 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 that are incremental to the incentive and entrenchment effects already documented in prior literature. We also control for *Vested Options*, which is the number of option holdings that are exercisable within six months since the beginning of the year divided by total common shares outstanding. *Vested Options* and *Longholder* have a high correlation of 0.25 in our sample but while the amount of vested options is the consequence of board decisions on compensation structure, the decision to delay exercise is the manager's choice and we wish to isolate that effect.[8]

G. 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 $ 4.2 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 2.60.

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 20 percent of the sample firms have an overconfident CEO at some point and using the *Holder67* metric, 56 percent of the CEOs are classified as overconfident within the relevant sub-sample of 151 firm-years.

[8] While there could be some restrictions on minimum holding requirements imposed by the board that could result in delayed exercise, as we discuss in Appendix IB, our results hold even when we exclude the firms where CEOs have low ownership and therefore the minimum holding requirements are more likely to be binding.

Panel C illustrates the characteristics of the bonds issued. Bonds are generally used for long-term financing. The average maturity is about 193 months (16 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 (23 percent), shops (13 percent), and utility firms (11 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.

III. Methodology and Results

A. Determinants of Bond Covenant Restrictions

A.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:

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

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.

A.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 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 7.4 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 7.1 and 15.8 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 also 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 history and design covenants restrictions accordingly. We therefore control for past firm level investment, merger and financing activities in each regressions. This allows us to tease out the effects associated with observable past activities 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, Panels A and B of Table 2 show 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. F-tests comparing the coefficient of *Post-Longholder* with that of *Pre-Longholder* are significant for *All Investment* and *Merger & Acquisition* models, but not for *Investment excluding M&A* model. 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.

B. The Role of Information Transparency, Delivered Profitability, 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 availability of the growth opportunities for the firm. Investment and financing restrictions are relatively more costly for firms with genuinely high growth opportunities and this may mitigate the costs of having a 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 is associated with lower likelihood of overall investment restrictions and merger restrictions.

Finally, overconfident CEOs of firms with a demonstrated track record of superior 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 manifested 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.

C. 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[9]. Overall, we only find weak evidence that overconfidence is priced even though we find strong evidence that it does affect the design of monitoring mechanisms.

D. 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.

[9] In unreported covenant restriction part of the SURE model result, we continue to find highly significant result that overconfident CEOs get more covenant restrictions than non-overconfident CEOs.

IV. Robustness Tests

A. CEO Effect vs. Unobserved Firm Effect

One important concern while interpreting our results is whether bond holders respond to the CEO's behavioral traits or whether the results are driven by unobserved firm characteristics. Although in our research design we have carefully controlled for a variety of observable firm level characteristics, it is still possible that firms with overconfident CEOs are different along certain dimensions from those with non-overconfident CEOs, which is unobservable to researchers and is unrelated to CEO behavioral traits. To address this concern, we re-estimate the relation between covenant restrictions and CEO overconfidence by controlling for firm fixed effects. To avoid the familiar incidental parameter problem (see Neyman and Scott, 1948; Wooldridge, 2001), we use the conditional logit model. This model estimates the likelihood of restrictive covenants conditional on the number of overconfident CEO observations for each firm, which gets rid of the unobserved fixed effects without explicitly estimating their coefficients and thus circumvents the issue of inconsistent estimates of the firm-specific intercept. By construction, the conditional logit is only identified for firms that have a change in CEO overconfidence and consequently, this analysis uses fewer observations.[10] Therefore, it essentially explores the effect on a subsample of CEO turnovers between overconfident and non-overconfident people. However, the cost of exploring both within-firm and within-CEO variation is that the sample size shrinks significantly. Therefore, we use this model only for robustness check purpose.

Table 7 presents the results. We estimate the effect of *Post-Longholder* across all types of restrictions, i.e., *All Investment*, *Investment excluding M&A*, *Merger & Acquisition*, as well as *Subsequent Financing*. Since we are estimating the effects on specific subsamples, each regression has only 163 to 280 observations. Across all models, *Post-Longholder* is consistently more likely to be restricted. Three out of four tests are statistically significant. The insignificant result for the *Investment excluding M&A* model again suggest that bondholders are more concerned about firm's inorganic growth than organic growth for overconfident CEOs. But, more importantly, this set of robustness tests reassures us that our previous findings are more

[10] See Malmendier and Tate (2008) for another application of conditional logit model on overconfident CEO in the context of merger.

likely to reflect bondholders' response to CEO personal traits, rather than unobserved firm characteristics.

B. Other Robustness Tests

We have also conducted several other robustness tests to check the sensitivity of our results to our research design. First, for each firm-year, we keep only the largest bond observations if there are multiple issuances. Our results are still hold. Second, as an alternative measure of firm level credit risk, we replace Altman Z-score with S&P credit rating. Instead of measuring firm's bankruptcy risk purely based on financial information as Z-score does, credit rating may incorporate rating agency's soft information about the firm's credit worth. To the extent that the soft information has incremental predictive ability about firm's credit worthiness beyond financial information, S&P credit rating may be a better measure of firm's credit risk. Our results do not change materially after this replacement. We choose to report the Altman Z-score results because using the S&P credit rating limits the size of the sample considerably. Finally, we control for year effects instead of industry effects. This is to ensure that our findings are not due to temporal changes in lenders' preferences for different covenants, which may correlate with the existence of overconfident CEOs in certain sample years. Our results continue to hold.

V. 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 stems from the behavioral characteristics of CEOs, specifically, CEO overconfidence. We examine whether CEO overconfidence affects the likelihood of including covenants in bond agreements that restrict investments, mergers and subsequent financing. We also examine whether CEO overconfidence is perceived more favorably when it appears to be justified by firm growth opportunities and past performance. In addition, we explore the role of information transparency in mitigating the adverse effects of CEO overconfidence.

We find that bond contracts are more likely to include investment related restrictions, consolidations and merger restrictions, and subsequent debt financing restrictions, when the firm has an overconfident CEO. 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. Restrictive covenants impose costs on an overconfident CEO making debt less attractive. In addition, overconfident CEOs are more likely to face restrictions on subsequent financing. Together, these results suggest an explanation for why overconfident managers appear to underuse debt.

We also find that not all overconfident CEO are treated the same way. When the overconfidence is backed by high growth opportunities and a strong track record, the firms do not face a higher likelihood of restrictive covenants. Similarly, information transparency 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 extends this literature and sheds light on how external parties 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 1A

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 in 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.

APPENDIX 1B

Alternative explanations for delayed option exercise

A central issue in interpreting our results is that while we ascribe delay in option exercise to CEO overconfidence, there could be alternative explanations for such option holding behavior. We discuss these alternative explanations here and also highlight similar robustness tests performed in Malmendier and Tate (2005) who use the same dataset and therefore face similar challenges.

1. **Risk-tolerance**

   We classify a person as overconfident if they continue to hold options beyond the thresholds that fall out of models that assume risk-averse CEOs. If the CEOs are not as risk averse as assumed in the model, they may have higher thresholds of in-the-moneyness of the options before they find it optimal to exercise. In that case we ascribe the delay to overconfident beliefs while the behavior may be the consequence of greater risk tolerance. Bondholders faced with more risk tolerant CEOs might seek greater covenant protection and therefore we would expect similar predictions from both CEO characteristics.

   One robustness test to tease out these two explanations is to examine dividend restrictions. Overconfident CEOs tend to avoid dividend payments (Malmendier and Tate, 2005) so that they can use that cash to invest in the firm. Therefore debtholders need not worry about excessive dividend payments and do not face the need to restrict such dividend payments through covenants. We would therefore expect overconfident CEOs to face fewer dividend restrictions. On the other hand, cross-sectional variation in risk preferences of CEOs does not predict any differences in dividend restrictions. Consistent with delayed exercise measuring overconfidence, we find that the fraction of firms with dividend restrictions is significantly lower for overconfident CEOs compared with the rest of the sample. Further, Malmendier and Tate (2005) argue that the result that overconfident managers are associated with higher investment cash flow sensitivity does not seem consistent with the risk preference argument since less risk averse managers should have lower investment cash flow sensitivity since they should be willing to issue

debt to meet their investment needs. Overall, the measure based on delayed option exercise appears to capture CEO overconfidence even though the risk tolerance argument cannot be entirely ruled out since both overconfidence and risk preferences are unobservable CEO personal traits

2. Inside information

CEOs may delay option exercise when they possess favorable private information about firm value however if bondholders infer such favorable information, we would expect to see fewer covenants and lower interest costs contrary to our finding. Further, Malemendier and Tate (2005) 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. Also, 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.

3. 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.

4. Minimum stock ownership requirements

CEOs may delay option exercise if the board of directors requires them to hold a minimum amount of the firm's stock or options. In such a case, if the ownership requirement is binding, the CEO would have to hold on to the in-the-money options even though he would prefer to exercise the options and sell the stock. Such a minimum ownership requirement are more likely to be binding for low levels of stock ownership by

the CEO and therefore we rerun the tests excluding the bottom decile of stock ownership levels and the results hold. Therefore we do not believe that such ownership requirements are driving our results.

5. **Tax reasons**

   CEO's may delay exercise to postpone paying taxes but this explanation should not suggest systematic differences in the extent of covenant protection that bondholders seek.

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=608). ***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 (working capital / total assets) + 1.4 (retained earnings/ total assets) + 3.3 (EBIT/Total Assets) + 0.6 (Public value of equity /Book value of total liabilities) + (Sales /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. ***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. ***Putable*** 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	311	0.04	0.04	0.06	-0.25	0.33
Leverage	311	0.25	0.24	0.13	0.00	0.73
Assets ($bln)	311	7.16	4.22	7.86	0.12	63.83
Tangibility	311	0.47	0.45	0.20	0.04	0.92
Market-to-Book	311	1.49	1.26	0.67	0.73	4.85
Z-Score	311	3.06	2.60	1.99	0.50	17.90
Past Capex and R&D	311	0.10	0.09	0.06	0.00	0.46
Past M&A	311	0.02	0.01	0.04	-0.01	0.19
Past Net Debt Issuance	311	0.02	0.01	0.05	-0.34	0.32
Abnormal Accruals	306	0.13	0.03	0.45	0.00	5.85
ROA	311	0.06	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	311	0.02	0	0.05	0	0.36
Vested Options	311	0.02	0.01	0.07	0	0.88
CEO Tenure	310	8.65	6	8.18	1	41
CEO Power	311	0.38		0.49	0	1
Longholder	311	0.19		0.39	0	1
Pre-Longholder	311	0.11		0.31	0	1
Post-Longholder	311	0.08		0.28	0	1
Holder 67	151	0.56		0.50	0	1

Panel C: Bond Characteristics

	Obs.	Mean	Median	Std. Dev.	Min.	Max.
Offering Amt ($mil)	608	182	150	198	.001	2,415
Maturity (months)	608	193	144	117	12	721
Callable	608	0.35		0.48	0	1
Putable	608	0.05		0.22	0	1
Private Placement	608	0.10		0.30	0	1
Convertible	608	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	30	9.65	39	6.41
Consumer Durables	16	5.14	22	3.62
Manufacturing	72	23.15	108	17.76
Energy	16	5.14	29	4.77
Chemicals and Allied Products	25	8.04	36	5.92
Business Equipment	20	6.43	32	5.26
Telecommunication	13	4.18	17	2.80
Utilities	34	10.93	105	17.27
Shops	40	12.86	60	9.87
Health	14	4.50	17	2.80
Money	0	0	0	0
Other	31	9.97	143	23.52
Total	311	100.00	608	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. ***Putable*** 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 Altman's (1968) Z-Score computed as a function of working capital, retained earnings, EBIT, market value of equity and sales. ***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. ***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	1.366***	(2.79)	0.881*	(1.77)	1.398***	(2.96)
CEO Power	0.656***	(4.12)	0.602***	(4.23)	0.896**	(2.37)
Stock Ownership	-0.209	(-0.11)	-0.420	(-0.24)	-0.469	(-0.28)
Vested Options	-0.584	(-0.44)	-0.505	(-0.36)	-0.520	(-0.33)
Concentration	-0.261	(-1.38)	-0.267	(-1.49)	-0.013	(-0.94)
Maturity	0.000	(0.18)	0.000	(0.47)	0.000	(0.06)
Callable	-0.550**	(-2.19)	-0.554**	(-2.21)	-0.578**	(-2.22)
Putable	0.413	(1.54)	0.247	(0.73)	0.672**	(1.99)
Private Placement	-0.396	(-0.37)	-0.419	(-0.40)	0.633	(0.95)
Convertible	0.706*	(1.91)	0.616*	(1.74)	0.283	(0.70)
Profit	-1.873	(-1.01)	-1.772	(-0.97)	-1.322	(-0.68)
Leverage	1.349	(1.03)	1.470	(1.20)	1.695	(1.13)
Size	-0.149	(-0.81)	-0.181	(-1.05)	-0.039	(-0.33)
Tangibility	0.119	(0.23)	0.276	(0.52)	-1.653**	(-2.37)
Market-to-Book	0.378	(1.49)	0.398	(1.57)	0.300	(0.94)
Z-Score	-0.103	(-1.05)	-0.096	(-1.05)	-0.076	(-0.64)
Past Capex and R&D	-1.826	(-0.84)	-1.881	(-0.89)	1.558	(0.52)
Past M&A	1.862	(0.55)	2.040	(0.72)	5.520	(1.34)
Past Net Debt Issuance	2.125	(1.06)	1.237	(0.76)	0.622	(0.31)
Constant	3.050	(1.27)	3.254	(1.45)	1.239	(0.93)
Industry Effects	Yes		Yes		Yes	
Observations	608		608		608	

Table 2 Panel B: Covenant Restrictions Tests - Holder 67

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Holder67	0.920***	(2.96)	0.857***	(2.64)	1.084***	(4.45)
CEO Power	0.758***	(2.73)	0.697**	(2.34)	0.837**	(2.41)
Stock Ownership	-2.006	(-0.72)	-2.055	(-0.74)	-0.750	(-0.25)
Vested Options	-3.065***	(-4.20)	-4.142	(.)	-3.332	(.)
Concentration	-0.052	(-0.41)	-0.109	(-0.69)	0.030	(.)
Maturity	0.001	(0.74)	0.001	(0.84)	0.001	(0.48)
Callable	-0.921**	(-2.54)	-0.822***	(-2.58)	-0.772***	(-3.02)
Putable	0.120	(0.35)	-0.106	(-0.28)	0.388	(0.76)
Convertible	0.991*	(1.84)	0.631	(1.09)	1.013**	(2.19)
Profit	-6.984*	(-1.93)	-5.457*	(-1.90)	-8.154**	(-2.07)
Leverage	2.392	(1.42)	3.231**	(2.05)	2.673*	(1.71)
Size	0.037	(0.15)	-0.113	(-0.43)	0.243	(1.26)
Tangibility	-1.029	(-1.11)	-0.448	(-0.52)	-2.327***	(-3.15)
Market-to-Book	0.507	(0.99)	0.576	(1.12)	0.291	(0.57)
Z-Score	-0.081	(-0.34)	-0.048	(-0.20)	0.016	(0.07)
Past Capex and R&D	1.895	(0.50)	1.433	(0.39)	5.484	(1.42)
Past M&A	-0.122	(-0.03)	-0.031	(-0.01)	4.125	(1.13)
Past Net Debt Issuance	3.715	(0.95)	0.333	(0.08)	1.160	(0.29)
Constant	0.620	(0.22)	1.347	(0.44)	-1.356	(-0.61)
Industry Effects	Yes		Yes		Yes	
Observations	257		257		257	

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. ***Putable*** 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 Altman's (1968) Z-Score computed as a function of working capital, retained earnings, EBIT, market value of equity and sales. ***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. ***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	0.368	(1.38)	0.379	(1.34)	0.475*	(1.73)
Post-Longholder	1.440***	(2.79)	0.947*	(1.90)	1.498***	(2.99)
CEO Power	0.656***	(3.92)	0.602***	(4.04)	0.897**	(2.34)
Stock Ownership	-0.187	(-0.10)	-0.394	(-0.22)	-0.517	(-0.33)
Vested Options	-1.257	(-0.89)	-1.187	(-0.84)	-1.558	(-0.90)
Concentration	-0.260	(-1.37)	-0.267	(-1.49)	-0.013	(-1.00)
Maturity	0.000	(0.13)	0.000	(0.42)	0.000	(0.03)
Callable	-0.558**	(-2.19)	-0.563**	(-2.21)	-0.589**	(-2.22)
Putable	0.436	(1.63)	0.268	(0.80)	0.704**	(2.11)
Private Placement	-0.376	(-0.36)	-0.399	(-0.38)	0.651	(0.98)
Convertible	0.707*	(1.93)	0.617*	(1.76)	0.289	(0.71)
Profit	-1.892	(-1.02)	-1.793	(-0.98)	-1.341	(-0.70)
Leverage	1.422	(1.11)	1.554	(1.31)	1.805	(1.24)
Size	-0.158	(-0.85)	-0.191	(-1.09)	-0.054	(-0.43)
Tangibility	0.089	(0.17)	0.247	(0.47)	-1.728**	(-2.48)
Market-to-Book	0.403	(1.51)	0.424	(1.60)	0.339	(1.01)
Z-Score	-0.106	(-1.06)	-0.099	(-1.06)	-0.081	(-0.68)
Past Capex and R&D	-1.939	(-0.90)	-1.995	(-0.96)	1.483	(0.51)
Past M&A	1.609	(0.47)	1.770	(0.61)	5.343	(1.30)
Past Net Debt Issuance	2.125	(1.06)	1.231	(0.75)	0.588	(0.29)
Constant	3.096	(1.28)	3.298	(1.47)	1.288	(0.96)
Industry Effects	Yes		Yes		Yes	
Observations	608		608		608	

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	0.037	0.314	0.029

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. ***Putable*** 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 Altman's (1968) Z-Score computed as a function of working capital, retained earnings, EBIT, market value of equity and sales. ***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. ***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: Effect of Information Transparency - Abnormal Accruals Based Tests

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Post-Longholder	0.729*	(1.65)	-0.173	(-0.35)	1.072**	(2.42)
Post-Longholder*Abnormal Accruals	14.699*	(1.96)	33.710***	(2.79)	8.400*	(1.67)
CEO Power	0.663***	(4.20)	0.632***	(4.32)	0.898**	(2.35)
Stock Ownership	-0.263	(-0.15)	-0.425	(-0.24)	-0.480	(-0.28)
Vested Options	-0.759	(-0.57)	-0.731	(-0.51)	-0.406	(-0.22)
Concentration	-0.281	(-1.51)	-0.304*	(-1.72)	-0.014	(-1.01)
Maturity	0.000	(0.20)	0.000	(0.43)	0.000	(0.06)
Callable	-0.533**	(-2.07)	-0.523**	(-2.04)	-0.570**	(-2.15)
Putable	0.465**	(2.02)	0.307	(1.03)	0.730**	(2.16)
Private Placement	-0.477	(-0.44)	-0.558	(-0.52)	0.604	(0.90)
Convertible	0.755**	(1.99)	0.697*	(1.89)	0.312	(0.78)
Profit	-1.556	(-0.86)	-1.403	(-0.75)	-0.907	(-0.52)
Leverage	1.530	(1.20)	1.614	(1.30)	1.898	(1.29)
Size	-0.189	(-1.06)	-0.227	(-1.32)	-0.065	(-0.54)
Tangibility	0.126	(0.23)	0.325	(0.56)	-1.635**	(-2.32)
Market-to-Book	0.362	(1.50)	0.399	(1.61)	0.273	(0.90)
Z-Score	-0.113	(-1.31)	-0.113	(-1.37)	-0.084	(-0.73)
Abnormal Accruals	0.325	(0.96)	0.345	(0.94)	0.284	(1.11)
Past Capex and R&D	-1.239	(-0.55)	-1.460	(-0.66)	2.340	(0.76)
Past M&A	1.490	(0.42)	1.165	(0.38)	5.380	(1.23)
Past Net Debt Issuance	1.830	(0.88)	1.225	(0.68)	0.194	(0.10)
Constant	3.382	(1.43)	3.668	(1.63)	1.335	(1.01)
Industry Effects	Yes		Yes		Yes	
Observations	600		600		600	

Table 4 Panel B: Effect of Observable Investment Opportunities – M/B Based Tests

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Post-Longholder	4.376***	(3.95)	1.753	(1.11)	4.637***	(4.48)
Post-Longholder*Market-to-Book	-1.377**	(-2.57)	-0.536	(-0.76)	-1.470***	(-2.90)
CEO Power	0.638***	(3.91)	0.584***	(4.19)	0.883**	(2.31)
Stock Ownership	-0.343	(-0.18)	-0.515	(-0.29)	-0.619	(-0.36)
Vested Options	-0.574	(-0.40)	-0.506	(-0.35)	-0.333	(-0.17)
Concentration	-0.254	(-1.34)	-0.260	(-1.46)	-0.012	(-0.93)
Maturity	0.000	(0.14)	0.000	(0.49)	0.000	(0.03)
Callable	-0.548**	(-2.13)	-0.555**	(-2.20)	-0.581**	(-2.18)
Putable	0.412	(1.53)	0.238	(0.70)	0.678**	(1.98)
Private Placement	-0.387	(-0.36)	-0.407	(-0.38)	0.619	(0.92)
Convertible	0.751**	(2.03)	0.635*	(1.78)	0.325	(0.80)
Profit	-1.604	(-0.81)	-1.582	(-0.80)	-1.073	(-0.51)
Leverage	1.380	(0.99)	1.501	(1.18)	1.709	(1.09)
Size	-0.138	(-0.75)	-0.176	(-1.02)	-0.037	(-0.31)
Tangibility	0.162	(0.30)	0.297	(0.54)	-1.645**	(-2.34)
Market-to-Book	0.387	(1.39)	0.404	(1.54)	0.319	(0.94)
Z-Score	-0.080	(-0.73)	-0.083	(-0.80)	-0.061	(-0.48)
Past Capex and R&D	-2.127	(-1.01)	-2.037	(-1.01)	1.343	(0.46)
Past M&A	1.234	(0.37)	1.773	(0.64)	5.180	(1.25)
Past Net Debt Issuance	2.352	(1.15)	1.298	(0.79)	0.796	(0.40)
Constant	2.948	(1.22)	3.181	(1.41)	1.237	(0.92)
Industry Effects	Yes		Yes		Yes	
Observations	608		608		608	

Table 4 Panel C: Effect of Prior Delivered Performance- ROA Based Tests

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition	
Post-Longholder	3.674***	(3.07)	1.303	(1.10)	3.683***	(3.68)
Post-Longholder*ROA	-23.040**	(-2.09)	-5.625	(-0.55)	-24.213***	(-2.61)
CEO Power	0.660***	(3.92)	0.613***	(3.97)	0.884**	(2.43)
Stock Ownership	-0.269	(-0.15)	-0.419	(-0.24)	-0.529	(-0.32)
Vested Options	-0.492	(-0.33)	-0.331	(-0.21)	-0.365	(-0.21)
Concentration	-0.248	(-1.29)	-0.255	(-1.42)	-0.012	(-0.85)
Maturity	0.000	(0.13)	0.000	(0.41)	0.000	(0.00)
Callable	-0.568**	(-2.09)	-0.567**	(-2.16)	-0.592**	(-2.28)
Putable	0.370	(1.37)	0.205	(0.59)	0.654**	(2.05)
Private Placement	-0.429	(-0.39)	-0.457	(-0.42)	0.588	(0.87)
Convertible	0.758**	(2.03)	0.648*	(1.82)	0.332	(0.84)
Leverage	1.609	(1.30)	1.760	(1.54)	2.086	(1.49)
Size	-0.132	(-0.72)	-0.170	(-0.99)	-0.032	(-0.27)
Tangibility	0.061	(0.11)	0.186	(0.33)	-1.774**	(-2.32)
Market-to-Book	0.320	(1.10)	0.320	(1.15)	0.249	(0.77)
Z-Score	-0.102	(-0.88)	-0.106	(-0.96)	-0.067	(-0.56)
ROA	0.961	(0.50)	1.355	(0.67)	1.647	(0.89)
Past Capex and R&D	-1.669	(-0.77)	-1.531	(-0.72)	1.773	(0.60)
Past M&A	1.148	(0.33)	1.659	(0.59)	5.113	(1.19)
Past Net Debt Issuance	1.735	(0.74)	0.593	(0.32)	-0.106	(-0.05)
Constant	2.806	(1.17)	3.047	(1.36)	1.082	(0.82)
Industry Effects	Yes		Yes		Yes	
Observations	608		608		608	

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. ***Putable*** 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 Altman's (1968) Z-Score computed as a function of working capital, retained earnings, EBIT, market value of equity and sales. ***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. ***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	73.816***	(3.39)	73.816	(1.30)
Post-Longholder*Investment Restriction	-74.786***	(-3.48)	-74.786	(-1.30)
CEO Power	-1.236	(-0.14)	-1.236	(-0.23)
Stock Ownership	75.302	(1.20)	75.302	(1.41)
Vested Options	73.421*	(1.75)	73.421	(1.48)
Concentration	4.553**	(2.01)	4.553	(1.56)
Maturity	0.140***	(5.70)	0.140***	(6.41)
Callable	-56.584***	(-5.93)	-56.584***	(-8.73)
Putable	-47.789***	(-6.05)	-47.789***	(-4.23)
Credit Spread	-23.925	(-1.55)	-23.925***	(-2.66)
Private Placement	24.821	(1.31)	24.821	(0.45)
Convertible	-17.979**	(-2.01)	-17.979*	(-1.89)
Profit	56.098	(0.74)	56.098	(1.20)
Leverage	118.306***	(3.25)	118.306***	(4.10)
Size	6.930	(1.26)	6.930*	(1.85)
Tangibility	-49.890**	(-2.19)	-49.890***	(-2.71)
Market-to-Book	-21.377***	(-2.90)	-21.377***	(-2.63)
Z-Score	-0.279	(-0.09)	-0.279	(-0.08)
Past Capex and R&D	204.542***	(2.67)	204.542***	(3.34)
Past M&A	140.860**	(2.02)	140.860*	(1.69)
Past Net Debt Issuance	-145.822***	(-2.65)	-145.822**	(-2.32)
Investment Restrictions	31.247***	(4.25)	31.247***	(4.11)
Constant	-18.536	(-0.28)	-18.536	(-0.41)
Industry Effects	Yes		Yes	
Observations	524		524	

Table 6: Subsequent Financing Tests

This table provides results examining the effect of overconfident CEO on subsequent financing restrictions. 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. ***Putable*** 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 Altman's (1968) Z-Score computed as a function of working capital, retained earnings, EBIT, market value of equity and sales. ***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. ***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	1.296***	(3.82)	1.338***	(3.74)		
Pre-Longholder			0.280	(0.81)		
Holder67					0.900***	(2.94)
CEO Power	-0.581**	(-2.14)	-0.583**	(-2.14)	-0.198	(-0.39)
Stock Ownership	-2.949**	(-2.04)	-2.998**	(-2.20)	3.362	(1.23)
Vested Options	-2.356	(-0.88)	-3.026	(-1.36)	-6.215**	(-2.37)
Concentration	0.056	(1.38)	0.055	(1.37)	0.105***	(3.99)
Maturity	-0.000	(-0.28)	-0.000	(-0.29)	0.001	(0.98)
Callable	-0.359	(-1.37)	-0.364	(-1.37)	-0.847**	(-2.48)
Putable	-0.314	(-0.89)	-0.317	(-0.90)	-1.059	(-1.22)
Convertible	-2.327***	(-5.80)	-2.308***	(-5.76)		
Profit	-1.102	(-0.54)	-1.124	(-0.55)	1.434	(0.51)
Leverage	0.069	(0.05)	0.109	(0.08)	2.231	(1.07)
Size	0.213	(1.19)	0.204	(1.15)	0.545**	(2.09)
Tangibility	0.370	(0.46)	0.339	(0.42)	-0.314	(-0.31)
Market-to-Book	1.188**	(2.14)	1.186**	(2.15)	1.898**	(2.01)
Z-Score	-0.261	(-1.04)	-0.260	(-1.06)	0.225	(0.46)
Past Capex and R&D	-7.221**	(-2.21)	-7.311**	(-2.27)	-4.482	(-1.42)
Past M&A	-3.527	(-0.88)	-3.696	(-0.92)	-8.736	(-1.33)
Past Net Debt Issuance	-1.228	(-0.41)	-1.221	(-0.41)	-3.134	(-0.45)
Constant	-0.420	(-0.19)	-0.334	(-0.15)	-8.480***	(-3.22)
Industry Effects	Yes		Yes		Yes	
Observations	549		549		210	

Table 7: Robustness Tests

This table provides results examining the effect of overconfident CEO on all (four) types of restrictions after controlling firm level fixed effects. The regression is run by conditional logit model. ***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. ***Subsequent Financing*** 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. ***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. ***Putable*** 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 Altman's (1968) Z-Score computed as a function of working capital, retained earnings, EBIT, market value of equity and sales. ***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. 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 7: Robustness Tests (Continued)

	(1) All Investment		(2) Investment (Excluding M&A)		(3) Merger & Acquisition		(4) Subsequent Financing	
Post-Longholder	15.624***	(3.42)	0.140	(0.07)	16.051***	(15.20)	4.647**	(2.28)
CEO Power	1.367**	(2.00)	1.431**	(2.12)	2.148*	(1.84)	-4.386	(-1.37)
Stock Ownership	3.879	(0.23)	-9.060	(-1.03)	-9.835	(-0.83)	-81.888	(-0.75)
Vested Options	-42.929	(-1.42)	-0.548	(-0.06)	-10.437	(-0.38)	18.033	(0.99)
Concentration	-0.163	(-1.37)	-0.518	(-0.46)	0.109	(0.87)	-0.095	(-0.64)
Maturity	-0.001	(-0.15)	0.001	(0.31)	-0.003	(-0.73)	0.004	(1.50)
Callable	0.694	(0.92)	-0.404	(-0.62)	-1.158	(-1.10)	-2.460*	(-1.86)
Putable	-1.720	(-1.11)	-0.584	(-0.41)	-1.788	(-1.12)	1.599*	(1.70)
Private Placement	-48.790***	(-3.73)	-32.840***	(-6.36)	-35.146***	(-4.32)	-17.262***	(-20.39)
Convertible	3.506	(0.86)	3.082	(1.02)	1.990	(1.24)	-16.648**	(-2.28)
Profit	-104.230*	(-1.74)	-69.191***	(-3.40)	-110.658*	(-1.68)	49.462*	(1.69)
Leverage	-13.908	(-0.46)	4.238	(0.34)	-15.668	(-0.92)	-64.475	(-1.57)
Size	9.138**	(2.03)	4.089**	(2.25)	5.979**	(2.04)	6.375	(1.07)
Tangibility	49.557**	(2.25)	30.034***	(3.00)	-19.000*	(-1.79)	23.630	(0.90)
Market-to-Book	3.914	(1.55)	0.433	(0.23)	0.819	(0.24)	10.119	(1.56)
Z-Score	3.559	(1.64)	4.556**	(2.45)	2.321	(0.89)	-5.354	(-1.30)
Past Capex and R&D	31.591	(0.96)	1.351	(0.07)	53.483	(1.42)	-51.542	(-1.44)
Past M&A	41.921	(1.02)	2.737	(0.13)	6.614	(0.32)	-153.273**	(-2.55)
Past Net Debt Issuance	-4.051	(-0.42)	1.973	(0.24)	5.340	(0.65)	70.767***	(2.99)
Firm Fixed Effects	Yes		Yes		Yes		Yes	
Observations	163		179		170		280	