Managerial Beliefs and Corporate Financial Policies*

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Abstract

We show that managerial beliefs and personal experiences explain a significant portion of the variation in corporate financial policies, both across and within firms, that remains unexplained by standard capital-structure determinants. First, overconfident managers who believe that their company is currently undervalued view external financing as overpriced, especially equity financing. As a result, they prefer internal financing to debt and debt to equity (pecking order). They also underutilize debt relative to its tax benefits (debt conservatism). Using late option exercise as a measure of perceived undervaluation, we find that, conditional on accessing public markets, overconfident CEOs are less likely to issue equity. They raise 33 cents more debt to cover an additional dollar of financing deficit than their peers. They are also less likely to access any external finance (debt or equity), resulting in debt conservatism. Second, CEOs who grew up during the Depression and who are often purported to have less faith in capital markets lean excessively on internal financing, under-utilizing debt relative to its tax benefits. Third, CEOs with prior military service, particularly World War II veterans, choose more aggressive capital structures with higher market leverage ratios, consistent with military service inducing higher aggressiveness (lower risk aversion), particularly after combat exposure. The identification of individual managerial beliefs and formative experiences emerges as an important tool to explain variation in corporate financial policies.

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I. Introduction

What are the primary determinants of firms' financing decisions? Traditional theories emphasize firm, industry and market forces like the trade-off between tax deductibility of interest payments and bankruptcy costs, or asymmetric information between firms and the capital market (Miller (1977), Myers (1984), Myers and Majluf (1984)). These theories explain significant observed variation in capital structure; yet, recent research identifies firm-specific stickiness in capital structure that is not a clear prediction of either theory (Lemmon et al (2008)). Moreover, traditional theories, even in modern dynamic implementations, do not easily explain why firms with similar fundamentals sometimes make different financing choices. In this paper, we study the role of managerial beliefs in explaining puzzling variation in capital structure choices.

First, we consider a specific form of variation in managerial beliefs. We analyze the financing choices of managers with (overly) optimistic views about future firm performance. Overconfident managers perceive their firms to be undervalued by the market. As a result, they view external financing to be unduly costly and prefer to use cash or riskless debt whenever possible. Thus, they may display debt conservatism, measured by low levels of risky debt relative to available interest tax deductions. At the same time, they prefer risky debt to equity conditional on raising risky capital, since equity prices are more sensitive to differences of opinions about future cash flows.

Second, we consider variation in managers' personal histories which is likely to generate differences in beliefs. We identify two specific formative experiences: growing up during the Great Depression and serving in the military. CEOs who grew up during the Depression are likely to have less faith in capital markets and may therefore lean excessively on internal financing. Military service typically occurs in early adulthood and, particularly when it results in combat exposure, is likely to lead to more aggressive beliefs (or lower risk aversion), which may later manifest in less conservative capital structure choices.

We test these predictions on a panel data set of large U.S. companies. We measure overconfidence using measures from Malmendier and Tate (2008) and (2005). The main measure ("Longholder") identifies CEOs who systematically maintain high exposure to company-specific risk in their personal portfolios. The CEOs in our data have a strong incentive to diversify their holdings since they receive substantial equity-based compensation and the value of their

human capital depends on firm performance. Yet, some CEOs hold non-tradeable, in-the-money executive stock options until expiration rather than exercising them after the vesting period. This personal investment is not explained by insider knowledge, as it does not yield abnormal returns over a simple strategy of exercising and diversifying. A plausible interpretation is that these CEOs overestimate the means of their firms' future cash-flows.[1] We address several alternative interpretations, including signaling and risk tolerance, and separate years before and after a CEO's first late exercise ("Pre-" and "Post-Longholder"). We also identify CEOs who do not exercise options which are highly in the money (67%) five years prior to expiration ("Holder 67").[2] As a robustness check, we identify CEOs' beliefs based on their portrayal as "confident" or "optimistic" in the business press.

We then relate our measures of managerial beliefs to corporate financial policies. Using SDC data on security issuance, we find that overconfident CEOs are significantly less likely to issue equity, conditional on accessing public markets. We find the same pattern using accounting data from Compustat, which includes private financing, and the methodology of Shyam-Sunder and Myers (1999): CEOs with optimistic beliefs raise roughly 33 cents more debt than their peers to cover an additional dollar of external financing required to meet current cash commitments. Next, we test whether overconfident CEOs' reluctance to access external capital markets leads to debt conservatism. Using the methodology from Graham (2000), we find that CEOs with optimistic beliefs are significantly more likely to under-utilize debt relative to the tax benefits. While they do not abstain from issuing riskless debt (for which there is no disagreement about the appropriate interest rate), they are more conservative than their peers when they have intermediate S&P debt ratings. Among overconfident CEOs, the most debt-conservative CEOs are also least likely to issue equity. Given the impact of overconfidence on financing choices, we ask whether CEO overconfidence can explain observed differences in firm leverage. We find that firms have significantly higher leverage ratios in years in which they employ overconfident CEOs.

We perform a parallel exercise for CEOs born in the decade leading up to the Great Depression and for CEOs with a military background. We show that Depression CEOs under-utilize

[1] Under-estimation of the variance (rather than mean) of cash flows, which is also sometimes referred to as 'overconfidence' in the finance literature, would reduce option value and predict early rather than late exercise. Thus, our measures do not capture this form of mistaken beliefs.

[2] The 67% threshold comes from the rational option exercise model of Hall and Liebman (2002) with constant relative risk aversion of 3 and 67% of wealth in company stock.

debt relative to its tax benefits (and moreso than the average CEO). Moreover, we show that they do not simply substitute equity issuance for debt, confirming an aversion to risky capital markets. We then show that CEOs with prior military service – and particularly those who served in World War II – choose more aggressive capital structures: They choose significantly higher market leverage ratios than their predecessors or successors. Finally, to sharpen the interpretation of the two background proxies, we examine their correlation with several firm and CEO characteristics. Most notably, we find a positive correlation between membership in the depression cohort and press articles describing the CEO as "reliable," "cautious," "practical," "conservative," "frugal," or "steady." However, military service has a significant negative correlation with such press coverage and a significant positive correlation with merger frequency.

Our findings demonstrate the importance of managerial beliefs for financing decisions. The distinction between different types of managers allows us to explain otherwise puzzling capital-structure variation within firms and between similar firms. One limitation of our analysis, however, is that we identify the beliefs of CEOs, but not of CFOs, for whom we do not have data on personal characteristics and portfolio choices.[3] As a result, our findings allow for two interpretations: (1) CEO beliefs directly determine financing, and (2) CFOs determine financing, but their decisions are positively correlated with CEO beliefs. It is likely, however, that CEOs make the ultimate financing decisions. While the role of CFOs in financing decisions is important, the CEO alone can withdraw a stock offering at the last moment (Hechinger (1998)) or overrule the CFO and treasurer (Whitford (1999)).[4]

Our results fill a critical gap in the literature on managerial overconfidence, initiated by Roll (1986).[5] Preferences among different financing instruments are an implicit prediction in much of the literature, yet, to our knowledge, remain untested using field data from corporations. This paper links CEO overconfidence directly to financing in large U.S. firms. Our results also build upon a large social psychology literature on the "better than average" effect and overcon-

[3] Using ExecuComp data on the top five executives in S&P 1500 firms, one could construct similar measures. However, the data is not as detailed, often missing for CFOs, and available for a shorter time frame.

[4] It is not unusual that a financing plan proposed by the CFO is disapproved by the CEO, especially when sales of assets are involved (Millman (2001)). Recent jury verdicts against CEOs of firms with financial scandals imply the same point of view.

[5] See the survey by Baker, Ruback, and Wurgler (2006). Recent work includes Hietala, Kaplan, and Robinson (2003); Landier and Thesmar (forthcoming); Lowe and Ziedonis (2006) and the literature reviewed below.

fidence.[6] Executives appear to be particularly prone to display overconfidence.[7] One reason may be sorting of high-confidence individuals into top corporate positions (Goel and Thakor, forthcoming). In addition, self-attribution bias may enhance the confidence of individuals who achieve the string of successes necessary to attain a CEO position (Miller and Ross, 1975). Finally, CEOs face exactly the kind of environment that invites overconfidence: they are the most powerful executives in their firms, potentially inducing "illusion of control" and they are highly committed to good outcomes.[8]

We also contribute to the growing literature linking managerial beliefs to financing choices. Jenter (2004) shows that CEOs are net sellers of stock when book-to-market ratios are low, suggesting a belief that their firms are overvalued. This evidence, combined with Baker and Wurgler (2002), connects CEO beliefs to financing choices and emphasizes the arbitrage role of rational managers in inefficient equity markets. We build instead on the literature considering biased managerial beliefs in an efficient market. Heaton (2002) models the financing choices of optimistic CEOs. Hackbarth (forthcoming) incorporates optimism and overconfidence in a model of corporate borrowing and shows that these biases help to overcome conflicts between managers and shareholders related to debt overhang, such as underinvestment and diversion of funds. Graham and Harvey's (2001) CFO Outlook Survey suggests a direct role for biased managerial beliefs. In the second quarter of 1999, prior to the end of the technology bubble, roughly 70% of the survey respondents state that their company stock is undervalued, and 67% say that misvaluation is an important factor in the decision to issue stock. Ben-David, Graham, and Harvey (2007) relate the mis-calibration of CFOs revealed in such surveys to a wide range of corporate decisions, including corporate financing. Finally, Malmendier and Tate (2005) argue that the investment decisions of overconfident managers are more sensitive to cash-flow, particularly among firms with low debt capacity. However, the preference for internal over external financing – which drives the investment results – is not directly tested. This shortcoming leaves the results open to alternative interpretations and to concerns about the endogeneity of investment regressions.

[6] Larwood and Whittaker (1977), Svenson (1981), and Alicke (1985) show that individuals appear to overstate their skills relative to the average of a reference group. The effect extends to economic decision-making in experiments (Camerer and Lovallo (1999)).

[7] Larwood and Whittaker (1977); Kidd (1970); Moore (1977).

[8] Weinstein (1980); Alicke et al. (1995). March and Shapira (1987) and Langer (1975) find that CEOs believe they can control firm outcomes and tend to underestimate the likelihood of failure.

Our results also add to recent research exploring belief formation and the impact of prior life experiences on current beliefs. Donaldson (1990) argues that corporate leaders who were "young adults" in the 1930s were "profoundly affected by the collapse of the capital markets during the Great Depression," leading them to be "deeply skeptical of the public capital markets as a reliable source of personal or corporate funding" and "to have an instinctive affinity for a strategy of self-sufficiency" (p. 125). Consistent with this view, Graham and Narasimhan (2004) find that Depression-era CEOs choose lower leverage in the 1940s than CEOs who did not serve during the Depression. Malmendier and Nagel (2008) find related evidence that past macroeconomic experiences affect current choices in the realm of personal investment. Regarding military service, Berkowitz and Lepage (1967) find that weapons are "aggression-elicitng stimuli" and Killgore et al (2008) find that combat exposure increases the propensity to engage in risky behavior upon returning from deployment. Wansink et al (2008) find higher risk-taking propensity among a sample of World War II veterans.

Finally, we contribute to the extensive empirical literature studying firm's capital structure choices. Bertrand and Schoar (2003) and Frank and Goyal (2007b) show that managerial traits matter for financial policy. We build upon these studies, identifying both specific managerial beliefs which affect financing choices and a potential mechanism through which managerial beliefs may form. To the extent that managerial beliefs are sticky or are influenced by major shocks which occur well before they assume their positions, variation of the type we identify can help to explain a finding of firm fixed effects in capital structure choices which are unrelated to traditional cross-sectional controls. Moreover, the effects can be formalized in a predictive economic model. We also provide a new angle on the older literature testing pecking-order and trade-off theories. Shyam-Sunder and Myers (1999), for example, argue that the tendency of firms to fill financing deficits with new debt rather than equity issues supports the pecking-order theory over a static trade-off model. Frank and Goyal (2003) use the same empirical methodology on an extended sample of firms to argue in favor of the trade-off model. Fama and French (2002) find evidence that contradicts both theories. We provide a new angle on these theories, explaining residual variation which is difficult to reconcile with either theory using variation in managerial beliefs. For example, one way to de-couple observed pecking order financing choices from positive inside information is to allow the possibility of overly optimistic managerial beliefs.

The remainder of the paper is organized as follows. In Section II. we present a model that relates corporate financing decisions to managerial beliefs. Section III. describes the data and the construction of our key variables. Section IV. relates financing choices to overconfidence. Section V. relates early life experiences to financial policy. Section VI. concludes.

II. Model

In this section, we provide a simple framework to examine the capital structure predictions of a specific source of variation in managerial beliefs: CEO (over-) confidence. We also use the framework to discuss the potential implications of formative past experiences – like growing up during the Great Depression or military (and war) experience – for financing choices. We abstract from market frictions like agency costs and asymmetric information; however, such factors will not change our predictions as long as they affect managers uniformly and are not sufficient to create boundary solutions (e.g. full debt financing for a rational CEO).

We consider the manager's decision to undertake and finance a single, non-scalable investment project with cost I and stochastic return $\widetilde{R}$, given by R_G with probability $p \in (0;1)$ and R_B with probability $1-p$, where $R_G > I > R_B$. The firm pays taxes at marginal rate τ on the net return $\widetilde{R} - I$ if $\widetilde{R} > I$. The cost and the return distribution are common knowledge. We assume perfectly competitive debt and equity markets and normalize the risk-free interest rate to zero. The firm has existing assets A and internal funds C. The CEO maximizes the perceived value of the company to existing shareholders.[9] We allow for the possibility that the CEO overestimates (after-tax) project returns, $\hat{E}[\tilde{R}-\tau 1_{\{R>I\}}(\tilde{R}-I)] > E[\tilde{R}-\tau 1_{\{R>I\}}(\tilde{R}-I)]$, and the value of assets in place, $\widehat{A} > A$.

We first consider the unconditional choice between internal financing (i.e. using cash and riskless debt, denoted by $c \leq C$) and equity. We assume that the firm has $s > 0$ shares outstanding and denote by $s' \geq 0$ the number of new shares the CEO issues as part of the financing plan. We also assume that the bias in the CEO's expectation of project returns and in his valuation of existing assets does not depend on c.[10]

[9] Note that a CEO who maximizes value to current shareholders would never buy back shares since it is a zero-sum game: Some current shareholders are helped at the expense of other current shareholders.

[10] Formally, we assume $\frac{\partial}{\partial c}\hat{E}[\tilde{R} - \tau 1_{\{R>I\}}(\tilde{R} - I)] = 0$ and $\frac{\partial}{\partial c}\widehat{A} = 0$.

Proposition 1 *Overconfident CEOs strictly prefer internal finance to equity and use weakly more internal financing than rational CEOs.*

Proof. See Appendix A.

Overconfident CEOs perceive the price for new issues to be too low since they believe markets underestimate future cash flows. Proposition 1 immediately extends from equity to risky debt if the CEO overestimates cash flows in the default state (R_B): Since he overestimates cash flows going to creditors, he perceives interest payments on debt to be too high. Thus, overconfident CEOs have a strict preference for internal financing over risky debt or equity and exhaust cash reserves and riskless debt capacity before issuing risky securities.

Next, we analyze the choice between risky debt and equity, conditional on accessing external capital markets. From, Proposition 1, overconfident CEOs will exhaust all cash and riskless debt capacity before raising risky capital. Thus, we set cash and existing assets (which can be collateralized) to 0, $\widehat{A} = A = C = 0$.

Conditional on implementing the project and exhausting all riskless debt capacity created by the project, the maximization problem is:

$$\max_{\mathrm{d,s}} \quad \frac{s}{s+s'}\hat{E}[(\tilde{R} - \tau \mathbf{1}_{\{R>I\}}(\tilde{R} - I - [w-d]) - w)^+] \tag{1}$$

$$\text{s.t.} \quad \frac{s'}{s+s'}E[(\tilde{R} - \tau \mathbf{1}_{\{R>I\}}(\tilde{R} - I - [w-d]) - w)^+] = I - d \tag{2}$$

$$E[\min\{w, \tilde{R} - L\}] = d \tag{3}$$

$$R_B \leq d \leq I \tag{4}$$

where w is the face value of debt, d the market value of debt, and L the deadweight loss from bankruptcy. Interest payments $w - d$ are tax deductible. The CEO maximizes the perceived expected returns accruing to current shareholders after subtracting taxes and repaying debt, if any. Constraints (2) and (3) are the participation constraints for new shareholders and lenders, respectively. Note that the compensation required for equity and debt financing depends on investors' unbiased beliefs rather than managerial perception.

The following Proposition characterizes the financing choice of rational CEOs ($\hat{E}[\cdot] = E[\cdot]$):

Proposition 2 *Rational CEOs finance the risky portion of investment, $I - R_B$, using only*

risky debt if the tax benefits are high relative to bankruptcy costs, $\frac{\tau(I-R_B)}{1-\tau} > L$. *They use only equity if the tax benefits are low relative to bankruptcy costs,* $\frac{\tau(I-R_B)}{1-\tau} < L$. *They are indifferent if* $\frac{\tau(I-R_B)}{1-\tau} = L$.

Proof. See Appendix A.

If a CEO chooses to raise debt, it is optimal to set the debt level as high as possible since tax benefits are increasing in the amount of debt while bankruptcy costs are fixed. If the CEO chooses full equity financing, he avoids bankruptcy costs, but gives up the tax benefits of debt. The optimum, then, is either full debt or full equity financing, depending on whether the expected tax benefits, $\tau p(w-d)$, outweigh expected bankruptcy costs, $(1-p)L$.[11]

Now consider a CEO who overestimates the returns to investment, $\hat{E}[\cdot] > E[\cdot]$. Specifically, assume that the CEO overestimates returns by a fixed amount Δ in the good state, $\hat{R}_G = R_G + \Delta$, but correctly perceives returns in the bad state, $\hat{R}_B = R_B$. This assumption allows us to isolate the mechanism which generates a preference for risky debt: over-valuation of the residual claim on cash flows in the good state.

Proposition 3 *Overconfident CEOs choose full debt financing more often than rational CEOs.*

Proof. See Appendix A.

An overconfident CEO is more likely to choose full debt financing than a rational CEO for two reasons. First, the CEO overestimates the tax benefits of debt since he overestimates future returns (i.e., overestimates cash flow R_G by Δ). Second, he perceives equity financing to be more costly since new shareholders obtain a partial claim on Δ. In our simple set-up, the CEO agrees with the market about the fair interest rate on risky debt since there is no disagreement about the probability of default or the cash flow in default states. Overconfidence also does not affect the decision to implement a project, conditional on external financing. Since capital markets do not finance negative net present value projects, overconfident CEOs destroy value 'only' by using risky debt in some cases in which equity would be cheaper. If we re-introduce A or C, overconfident CEOs may over-invest since they overvalue returns from investment and

[11] In the simple two-state setup, the optimal capital structure never includes both risky debt and equity. Interior leverage choices become optimal if we add an intermediate state in which the firm may or may not default depending on the level of debt chosen.

can finance negative net present value projects by diluting A or spending out of C. Likewise, if we allow for CEOs to perceive $\widehat{A} > A$, overconfident CEOs might under-invest due to concern over diluting claims on existing assets.[12]

Since we used $\hat{R}_B > R_B$ to argue that overconfident CEOs prefer internal finance to risky debt, we briefly consider the choice between risky debt and equity for a CEO who overestimates not only R_G but also R_B, e.g. $\hat{R}_B = R_B + \Delta$. If $\hat{R}_B \geq w \geq R_B$, overconfident CEOs mistakenly believe that they will not default in the bad state. If the probability of default is large and Δ is small, the CEO may misperceive debt financing to be costlier than equity financing, reversing the preference for risky debt over equity. Hence, Proposition 3 may fail in some cases. Intuitively, creditors seize all of Δ in the event of default on risky debt, but equity holders receive only a fraction of Δ in the bad state.

Overall, our analysis demonstrates that overconfidence can generate a preference for risky debt over equity, conditional on accessing external capital markets. This preference arises because overconfident CEOs prefer being the residual claimant on the full cash flow in non-default states to giving up a fraction of cash flows in all states. In addition, overconfident CEOs may exhibit debt conservatism. They raise little external financing of any kind, in particular less risky debt than rational CEOs. In other words, the absolute amount of debt used by overconfident CEOs may be smaller even if leverage is higher, as illustrated in Figure 1. Thus, variation in CEO confidence levels generates the following testable hypotheses:

Hypothesis 1. Conditional on accessing external financing (and conditional on a given financing deficit), overconfident CEOs issue more debt than rational CEOs.

Hypothesis 2. Unconditionally, overconfident CEOs issue debt more conservatively than CEOs who are not overconfident.

Our framework also allows us to highlight the distinction between overconfidence and beliefs arising from experience during the Great Depression or military service. Unlike overconfident CEOs, Depression CEOs do not overestimate the returns arising from hand-picked investment projects. Instead, they simply have a preference for self-sufficiency. Thus, while the prediction of Proposition 1 will hold for Depression CEOs, the mechanism is different. Depression CEOs may inefficiently underinvest to avoid risky capital markets, but we would not expect them to

[12] Propositions 1 and 2 of Malmendier and Tate (2004) derive these results formally in a parallel setup.

overinvest in bad projects when cash rich. Likewise, CEOs with a military background – and particularly with battlefield experience – are likely to have a preference for more aggressive policies (or less risk aversion), but do not necessarily overestimate returns from investment. In our framework (which assumes CEO risk-neutrality), one way to capture this behavior is to model a CEO who acts as if he is facing a bankruptcy cost $\widehat{L} < L$. Such a CEO would invest and access external capital markets optimally, but would choose higher leverage than other CEOs.[13] Thus, we have the following testable predictions about the impact of formative life experiences on capital structure decisions:

Hypothesis 3. CEOs who experienced the Great Depression in early adulthood access risky capital markets more conservatively than other CEOs.

Hypothesis 4. CEOs with a military background maintain higher leverage than other CEOs.

III. Data

To measure CEO beliefs about future stock performance, we use data on CEOs' personal investments from Hall and Liebman (1998) and Yermack (1995). The data details the stock ownership and set of option packages – including exercise price, remaining duration, and number of underlying shares – for the CEOs of 477 publicly-traded U.S. firms between 1980 and 1994 year by year. We also use included data on CEO age to identify birth cohort and hand-collected information on CEO military service from *Dun and Bradstreet* and *Who's Who in Finance and Industry*. The sample focuses on large companies: All firms appear at least four times on one of the Forbes magazine lists of largest US companies between 1984 and 1994. The sample selection is important since Frank and Goyal (2003) find systematic differences between the financing choices of small and large companies. Our results are primarily applicable to large firms. However, our results may generalize to small firms; for example, our tests focus on the interaction of overconfidence and financing rather than the average financing decision itself.

As an alternative way to measure CEO beliefs, we use their portrayal in the business press. We

[13] *More generally, reduced risk aversion may also have implications for investment. In our model, the baseline CEO is risk-neutral and invests optimally. However, a risk averse manager would tend to underinvest. Thus, reducing risk aversion would improve the efficiency of investment (as long as the manager is not risk-seeking).*

hand-collect annual data on the press coverage of our sample CEOs in *The Wall Street Journal, The New York Times, Business Week, Financial Times,* and *The Economist.* We count the total number of articles referring to the CEO and the subsets using the words "confident" or "confidence;" "optimistic" or "optimism;" and "reliable," "cautious," "practical," "frugal," "conservative," or "steady." We hand-check each article to ensure that the adjectives are used to describe the CEO and to determine whether they are negated. We also collect detailed information on the context of each reference. For example, we record whether the article is about the CEO, the firm, or the market or industry as a whole and, if the article is about the firm, the specific policies it references (earnings, products, mergers, culture).

We merge this CEO-level data with information on public security issues from Thomson's SDC Platinum database. We include all U.S. new issues of common stock, convertible debt, convertible preferred stock, non-convertible debt, and non-convertible preferred stock. We also include U.S. Rule 144A issues of these securities. To capture the impact of loans and other forms of private debt on financing choices, we use COMPUSTAT cash flow statement data to construct alternative measures of debt and equity issuance. We measure net debt issuance as the difference between long-term debt issuance (item 111) and long-term debt reduction (item 114). We measure net equity issuance as the difference between sales of common stock (item 108) and stock repurchases (item 115). Long-term debt reduction and stock repurchases are set to zero if they are missing or combined with other data items. We exclude financial firms (SIC codes 6000 - 6999) and regulated utilities (SIC codes 4900 to 4999) from our analysis.

We also construct the net financing deficit to capture the amount of financing the CEO has to raise through either debt or equity issues in a given firm year:

$$\mathrm{FD}_t = \mathrm{DIV}_t + \mathrm{I}_t + \Delta \mathrm{W}_t - \mathrm{C}_t$$

DIV is cash dividends; I net investment (capital expenditures + increase in investments + acquisitions + other uses of funds - sale of PPE - sale of investment);[14] ΔW the change in working capital (change in operating working capital + change in cash and cash equivalents + change in current debt);[15] and C cash flow after interest and taxes (income before extraordinary

[14] For firms reporting format codes 1 to 3, net investment is items 128 + 113 + 129 + 219 - 107 - 109; for firms reporting format code 7, it is items 128 + 113 + 129 - 107 - 109 - 309 - 310. When items are missing or combined with other items, we code them as 0.

[15] For format code 1, this is items $236 + 274 + 301$; for codes 2 and 3, $-236 + 274 - 301$; for code 7, $-302 -$

items + depreciation and amortization + extraordinary items and discontinued operations + deferred taxes + equity in net loss (earnings) + other funds from operations + gain (loss) from sales of PPE and other investments).[16] All definitions follow Frank and Goyal (2003). We use the value of book assets (item 6) taken at the beginning of the fiscal year to normalize debt and equity issuance and the financing deficit.

We also use COMPUSTAT to construct several firm level control variables. We measure Q as the ratio of market value of assets to book value of assets. Market value of assets is defined as book value of total assets (item 6) plus market equity minus book equity. Market equity is defined as common shares outstanding (item 25) times fiscal year closing price (item 199). Book equity is calculated as stockholders' equity (item 216) [or the first available of common equity (item 60) plus preferred stock par value (item 130) or total assets (item 6) minus total liabilities (item 181)] minus preferred stock liquidating value (item 10) [or the first available of redemption value (item 56) or par value (item 130)] plus balance sheet deferred taxes and investment tax credit (item 35) when available minus post retirement assets (item 330) when available. Book value of assets is total assets (item 6).[17] We measure profitability using operating income before depreciation (item 13) and asset tangibility using property, plants and equipment (item 8). We normalize both variables using the book value of assets at the beginning of the fiscal year. We measure book leverage as the quantity debt in current liabilities (data 34) plus long term debt (item 9) divided by the quantity debt in current liabilities (data 34) plus long term debt (item 9) plus common equity (item 60). We measure market leverage by replacing common equity with market equity in the definition of book leverage.

Finally, we use the "kink" variable, provided by John Graham. The construction of this variable and the associated control variables are described in Graham (2000).[18] The kink variable captures the amount of additional debt firms could issue before the marginal benefit of interest deductions begins to decline. When a firm is committed to low future interest payments, all of the interest payments are likely to be deducted from future profits and the tax benefits are

$303 - 304 - 305 - 307 + 274 - 312 - 301$. All items, excluding item 274, are replaced with 0 when missing or combined with other items.

[16] For codes 1 to 3, this is items $123 + 124 + 125 + 126 + 106 + 213 + 217 + 218$. For code 7, this is items $123 + 124 + 125 + 126 + 106 + 213 + 217 + 314$. Items are coded as 0 when missing or combined with other items.

[17] Definitions of Q and its components as in Fama and French (2002).

[18] See Table 1 for more detail. Following Graham (2000), all continuous controls in the kink regressions are winsorized at the 1% level.

equal to the interest payment times the marginal corporate tax rate. As debt levels and future interest payments increase, it becomes increasingly likely that the company cannot generate enough profits to fully realize the interest tax shield. Consequently, the expected marginal tax benefit is decreasing when an additional dollar of interest payment is committed. The kink is defined as the ratio of the hypothetical interest level at which the expected marginal benefits start to fall (numerator) to the actual amount of interest paid by the firm (denominator). Assuming the marginal cost of debt intersects the downward-sloping portion of the marginal benefit curve, a kink greater than 1 indicates that the firm has "left money on the table." The potential gain from adding debt increases with the kink. In this sense, high-kink firms use debt more conservatively.

The left columns of Table 1 present the summary statistics after excluding financial firms and utilities (Full Sample; 263 firms). Panel A shows the COMPUSTAT data and the distribution across the 12 Fama and French industries.[19] Panel B summarizes the variable kink and the control variables used in the kink regressions. In the latter analysis, the sample is reduced to 189 firms due to missing values of the controls required in the kink analysis. Panel C summarizes CEO characteristics and Table 2 summarizes SDC security issues.

IV. CEO Overconfidence

IV.A Overconfidence Measures

We take two approaches to identify CEO overconfidence. First, we infer CEOs' "revealed beliefs" from their decisions to exercise or hold non-tradeable company stock options. Our measures exploit the incentive to exercise options early due to underdiversification. CEOs in our sample receive large grants of company stock and options as compensation. In addition, their human capital is invested in their firms, so that bad firm performance also reduces their outside options. Due to their high exposure to the idiosyncratic risk of their companies, they should generally exercise their executive options early. The exact exercise schedule depends on individual wealth, risk-aversion and diversification (Hall and Murphy (2002)). If CEOs overestimate future returns of their firm, however, they may hold in-the-money options be-

[19] For definitions see http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

yond rational thresholds for exercise in order to personally benefit from expected stock price appreciation. Malmendier and Tate (*forthcoming*) translate this logic into three measures of overconfidence. We use the same measures, which allows us to interpret our results within the context of previous findings.

Longholder. Longholder is a binary variable which takes the value 1 for all CEOs who ever hold an option until the year of expiration even though the option is at least 40 percent in the money entering its final year. The exercise threshold of 40 percent corresponds to constant relative risk aversion of 3 and 67 percent of wealth in company stock in the rational option exercise model of Hall and Murphy (2002). The threshold removes the (rare) cases in which the decision to hold to expiration is easily rationalizable, such as underwater options.

The Longholder measure is a managerial fixed effect. The remaining measures allow for variation within the CEO's tenure.

Pre-Longholder / Post-Longholder. Post-Longholder is a dummy variable equal to 1 only after the CEO for the first time holds an option until expiration (provided it exceeds the 40 percent threshold). Pre-Longholder is equal to 1 for the rest of the CEO years where Longholder is equal to 1. Post-Longholder, then, allows us to isolate financing decisions after the CEO has revealed his confidence level.

Holder 67. To construct Holder 67, we consider all option holdings with five years remaining duration. Maintaining the previous assumptions on constant relative risk aversion and diversification, the new exercise threshold (in the Hall-Murphy framework) is 67 percent in the money. Holder 67 is a binary variable equal to 1 if a CEO fails to exercise options with 5 years remaining duration despite a 67 percent increase in stock price (or more) since the grant date. When we apply this measure, we restrict the comparison group to CEOs who were faced with this exercise decision, but chose to exercise rather than hold: A CEO enters the sample once he has an option with 5 years remaining duration that is at least 67 percent in the money. Once a CEO decides to postpone the exercise of such an option he receives a value of 1 under Holder 67 and retains that value for the remainder of his sample years.

Our second approach to identifying overconfidence exploits characterizations of sample CEOs in the business press. Our press data, described in Section III., provides the number of articles year-by-year that refer to each sample CEO using the terms (*a*) "confident" or "confidence," (*b*)

"optimistic" or "optimism," (c) "confident," but in a negated form (d) "optimistic," but in a negated form and (e) "reliable," "cautious," "conservative," "practical," "frugal," or "steady." For each sample year, we compare the number of *past* articles that portray the CEO as confident and optimistic to the number of *past* articles that portray him as not confident, not optimistic, reliable, cautious, conservative, practical, frugal, or steady. We define the following indicator of CEO confidence (where i denotes the CEO):

$$TOTALconfident_{it} = \begin{cases} 1 \text{ if } \sum_{s=1}^{t-1} a_{is} + b_{is} > \sum_{s=1}^{t-1} c_{is} + d_{is} + e_{is}; \\ 0 \text{ otherwise.} \end{cases}$$

We only use past media portrayal to ensure that financing policies do not affect the press measure directly. We also hand-check the context of the individual articles and find few articles about financial policy: Among the 960 articles primarily about the firm, 53% focus on company earnings, 17% on mergers, and fewer than 5% on financial policy.

It is possible that differential coverage could bias our TOTALconfident measure. If, for example, there is a press bias towards positive news stories, CEOs who are often in the press would be more likely to have TOTALconfident equal to 1. To address this possibility, we control for total mentions in the selected publications, aggregated over the same period as the TOTALconfident measure, whenever we utilize the measure.

In the right-hand columns of Table 1, we show firm and CEO summary statistics for the subsample of Longholder firm years. The sample characteristics are similar using the other measures of overconfidence. Moreover, the overconfidence measures are all positively and significantly correlated with each other. In Appendix B we address several alternative interpretations of our measures, including positive inside information and resulting dilution concerns.

IV.B Empirical Analysis

IV.B.1 Debt versus Equity

Overconfident managers are reluctant to issue equity because they believe that it dilutes the claims of existing shareholders. Debt, instead, allows current shareholders to remain the residual claimant on the firm's future cash flows. As a result, overconfident CEOs generally prefer

debt to equity. We test whether, conditional on accessing public securities markets, overconfident CEOs are less likely to issue equity (Hypothesis 1). We repeat the test in the standard 'financing deficit' framework (Shyam-Sunder and Myers (1999)), which extends the analysis to include private debt and accounts explicitly for the amount of outside financing (debt or equity) the firm has to raise to cover financing needs.

Specification 1: Public Issues Table 2 presents the frequencies of equity and debt issues, conditional on conducting a public issue. The test of Hypothesis 1 requires us to condition on accessing public markets, since overconfident and non-overconfident CEOs may access public markets with different frequencies. Years with both a debt and an equity issue count in both categories.

We find that the frequency of equity issuance is lower for overconfident CEOs under all of our measures. For Longholder CEOs, 31% of firm years with public issues contain at least one equity issue. This percentage is virtually constant across Pre- and Post- Longholder years. When Longholder is 0, instead, 42% of issue years contain an equity issue. The difference between the frequency of Longholder and non-Longholder equity issues is statistically significant at the 5% level, where standard errors are adjusted for clustering at the firm level. The results are stronger, both economically and statistically, using the Holder 67 and TOTALconfident measures. Holder 67 CEOs issue equity 23% of the time, but CEOs in the comparison group issue equity 39% of the time. TOTALconfident CEOs issue equity 25% of the time, but CEOs for whom TOTALconfident is 0 issue equity 48% of the time. For both measures, the differences are significant at the 1% level, again adjusted for clustering at the firm level.

Overconfident CEOs also issue debt at a higher frequency than other CEOs. Under all measures, the percentage of issuance years with at least one debt issue is higher for overconfident CEOs than in the comparison group. However, the difference is only statistically significant using the TOTALconfident measure. There are no significant differences for hybrid securities.

We test whether these cross-sectional patterns are robust to the inclusion of CEO- and firm-level controls in a logit model. The results of the estimations, using the Longholder measure, are in Table 3. The dependent variable is an indicator of at least one equity issue during the fiscal year. We first run a baseline logit with overconfidence as the only explanatory variable (Column 1). We then add portfolio controls for the incentive effects of performance-based

compensation: the percentage of company stock and the number of vested options held by the CEO (Column 2). Options are scaled by shares outstanding and multiplied by 10 so that the mean is comparable to the mean of stock holdings. In Column 3, we add the standard controls from the capital structure literature – the natural logarithm of sales, profitability, tangibility, Q, and book leverage – to capture the effects of known cross-sectional determinants of changes in leverage (Rajan and Zingales (1995)).[20] Leverage is a particularly important control as it captures systematic differences in the ability to (further) access debt markets. We then add year effects to control for the possibility that overconfident CEO-years are disproportionately clustered in cold markets for equity issuance. Finally, as an alternative approach to capturing the impact of traditional capital structure factors on financing choices, we use the full set of firm-level controls and industry dummies from Graham (2000):

Kink Controls are defined as in Graham (2002) and include dummies for No Dividend, Negative Owners' Equity, and NOL Carryforward, where NOL means net operating loss; ECOST (the product of (1) the standard deviation of the first difference in taxable earnings divided by assets and (2) the sum of advertising, research, and development expenses divided by sales); CYCLICAL (the standard deviation of operating earnings divided by mean assets first calculated for each firm,

then averaged for each two-digit SIC code); Return on Assets (income before extraordinary items plus interest expense plus depreciation, divided by assets); Z-Score (3.3 times the difference of operating income before depreciation and depreciation plus sales plus 1.4 times retained earnings plus 1.2 times working capital [balance sheet], divided by assets); Quick Ratio (sum of cash and short-term investments and total receivables divided by total current liabilities); Current Ratio (total current assets, divided by total current liabilities); Q-Ratio (preferred stock plus market value of common equity plus net short-term liabilities, divided by assets); R&D-to-Sales and Advertising-to-Sales. The final two variables are set to 0 when the numerator is missing. Industry Fixed Effects are the kink-regression industry dummies of Graham (2000); see Table 1, Panel B.

All control variables are measured at the beginning of the fiscal year and all standard errors are adjusted for firm-level clustering.

[20] When we use book leverage as a control, we drop the small number of observations for which book leverage is greater than 1.

In Table 3, we present these estimations using the Longholder measure. Similar to the pattern in the raw data, Longholder CEOs are $37 - 45\%$ less likely than other CEOs to issue equity across all specifications. The estimated effects are significant at the 5% or 10% levels. Among the controls, we find that smaller firms are more likely to issue equity. Large vested option holdings increase the odds of issuing equity, though the large coefficient estimate is driven by 5 outlier observations in the upper tail of the distribution. Eliminating those observations substantially decreases the coefficient without affecting the Longholder coefficient. One surprising result is that Q does not seem to positively predict equity issues. In an untabulated estimation, however, we find that stock returns over the prior year predict a significantly higher probability of issuing equity without materially affecting the Longholder estimate.

We also consider the robustness of the results to alternative sets of controls. For example, we re-estimate the regression using available controls from Gomes and Phillips (2007).[21] Missing *IBES* data requires us to drop observations prior to 1984. However, even with the roughly 40% smaller sample, we find qualitatively similar results (Longholder coeffiecient = -0.395; p-value = 0.188).

We also find similar results using the Holder 67 and TOTALconfident measures. The measured impact on equity issuance is stronger economically and statistically than the Longholder results in all cases but one. The one exception is the estimation including all controls and year effects with TOTALconfident as the overconfidence measure (odds ratio = 72%; p-value = 0.18). There are also no significant differences between the Pre- and Post-Longholder portions of the Longholder effect. All results are robust to alternative sets of controls; for example, including changes in sales, Q, profitability, or tangibility either in addition to or in lieu of the levels has little impact on the results. Finally, as in Table 2, we do not find consistently significant results when we use either debt or hybrid issuance as the dependent variable.

Overall, CEOs we classify as overconfident are less likely to issue equity conditional on accessing public securities markets, controlling for standard determinants of issuance decisions.

Specification 2: Financing Deficit We also consider the debt versus equity choice in the 'financing deficit framework' of Shyam-Sunder and Myers (1999), using data from cash flow

[21] *Since IRRC data is unavailable for our sample period, we use the natural log of board size as an alternative governance measure. We also do not have the marinal tax rate control.*

statements. This data adds bank loans and other private sources of financing to the analysis and allows us to use the full sample, rather than only years with a public security issuance. One immediate advantage of the larger sample is that we can include firm fixed effects, i.e., identify the impact of overconfidence separately from time-invariant firm effects. Moreover, the financing-deficit framework is particularly well-suited to test Hypothesis 1 since it conditions on the CEO's choice to raise external finance.

We test whether overconfident CEOs cover more of their financing deficits using debt than equity. The 'financing deficit' measures the amount of expenditures requiring external finance. This approach is analogous to conditioning on public security issuance in Section IV.B.1. Overconfident CEOs may raise more funds than rational CEOs (since they overestimate the returns to investment) or fewer funds (since they perceive external financing to be overpriced). Thus, rather than asking whether overconfident CEOs raise more dollars of debt or fewer dollars of equity than their peers, we test whether the mix of external finance depends on overconfidence.

We use the following regression specification:

$$\text{Debt}_{it} = \beta_1 + \beta_2 FD_{it} + X'_{it}B_3 + \beta_4 \Delta_{it} + FD_{it} \cdot X'_{it}B_5 + \beta_6 FD_{it} \cdot \Delta_{it} + \epsilon_{it} \qquad (5)$$

FD denotes the financing deficit (defined in Section III.), and Δ is the overconfidence proxy. The set X includes CEO- and firm-level controls. At the CEO level, we control for stock ownership and vested options (as in Table 3). At the firm level, we use the controls from Frank and Goyal (2003): book leverage and changes in profitability, tangibility, the natural logarithm of sales, and Q. All controls are included both as level effects and interacted with FD. We also include firm fixed effects and their interactions with FD. The fixed effects allow us to separate effects we attribute to the CEO from time-invariant firm effects. In the case of Holder 67 and TOTALconfident, we also exploit variation between a CEO's overconfident and non-overconfident years. Finally, we include year effects to control for the effects of hot equity issuance markets. All standard errors account for clustering at the firm level.

Table 4 presents the results of estimating (5) using Longholder as the overconfidence proxy. Column 1 presents a baseline regression without fixed effects or controls for comparison to prior literature. The coefficient of roughly 0.73 on the financing deficit is very close to the

effect estimated in Shyam-Sunder and Myers (1999), reflecting that our sample of large firms is more similar to their sample than to the Frank and Goyal (2003) sample.[22]

In Column 2, we add Longholder, its interaction with the financing deficit, firm fixed effects, and the interaction of firm fixed effects with the financing deficit. Note that we exclude the level effect of the financing deficit when including the interaction of the financing deficit with firm fixed effects to avoid collinearity. Alternatively, we could exclude the fixed effect dummy for one firm, but the coefficient of financing deficit would then depend on the (arbitrary) choice of which firm to exclude. Column 3 adds controls for CEO stock and option ownership, and Column 4 adds year fixed effects. In Column 5, we add changes in sales, changes in Q, changes in profitability, and changes in tangibility and, in Column 6, the lag of book leverage.[23]

Among the controls, deviations from (within-firm) average book leverage are negatively related to debt issues, consistent with leverage targeting. Above-average changes in Q predict less financing deficit covered with debt, consistent, for example, with market timing. More debt is used when CEOs have above average stock holdings, consistent with incentive effects in the presence of positive information (or overconfidence). Surprisingly, CEOs use significantly less debt when their option holdings are higher than average, though the economic magnitude is low (1-2¢ less debt per $1 of financing deficit for a 1 standard deviation increase in option holdings). In all specifications, Longholders use more debt than non-Longholder successors or predecessors in the same firm. The effect is significant at the 10% level and economically large, ranging from 32¢ to 35¢ more debt per $1 of financing deficit.

The results using the TOTALconfident proxy are qualitatively similar, though weaker economically and statistically. We find no significant difference between the Pre- and Post- Longholder portions of the Longholder estimate and very little impact of Holder 67, perhaps due to reduced sample size. We also re-estimate the regressions without firm fixed effects and their interactions with the financing deficit. Using the TOTALconfident measure, we find stronger results, both economically and statistically. Using Longholder, however, the interaction with the financing deficit becomes insignificantly negative. This finding suggests that Longholder

[22] Shyam-Sunder and Myers (1999) analyze large firms, with mean assets of $953m for the period 1971-1989. (Our firms are even larger, with mean assets of $5477m for the period 1980-1994.) When Frank and Goyal (2003) analyze, separately, the quartile of largest firms, they find similar coefficients of 0.753 for the period 1971-1989 and of 0.675 for the period 1990-1998.

[23] The results are nearly identical using lagged levels of the sales, tangibility, profitability, and Q controls (as in Section IV.B.1) rather than changes.

CEOs are concentrated in firms which, during our sample period, use more equity than debt to meet financing needs and underscores the importance of firm fixed effects.[24]

IV.B.2 Internal versus External Financing

Overconfidence not only predicts a preference for debt over equity, but also a preference for internal versus external finance (Hypothesis 2). A possible consequence is debt conservatism: Even though overconfident CEOs prefer debt to equity, their first choice is to forgo capital markets altogether, resulting in debt levels lower than the rational benchmark.[25]

We use the "kink" variable of Graham (2000) to measure debt conservatism. The kink captures how much firms could increase debt before the expected tax benefit begins to decline. Graham argues that firms, on average, leave money on the table by following excessively conservative debt policies. We ask whether overconfidence explains a portion of the effect. Overconfident CEOs may choose debt over equity when they access external markets (i.e. conditional on having a positive financing deficit), yet not access those markets frequently enough to take full advantage of the available tax benefits of debt. We use the following regression specification:

$$\text{Kink}_{it} = \beta_1 + \beta_2 \Delta_{it} + X'_{it} B_3 + Y'_{it} B_4 + \epsilon_{it}, \tag{6}$$

where Δ is the overconfidence measure, X are firm level controls and Y CEO portfolio characteristics. We include the firm controls from Graham's original tobit analysis, to ease comparison. All standard errors are clustered at the firm level. The null hypothesis is that β_2 is zero; overconfidence predicts $\beta_2 > 0$. We also test whether overconfident CEOs with high "kinks" simultaneously raise equity as a substitute for debt (which would falsify the overconfidence interpretation) and whether they have sufficient cash on hand to cover investment needs.

In Table 5, we present tobit estimates of (6) using Longholder for Δ. (The kink is artificially bounded between 0 and 8.) Column 1 shows a baseline regression without controls, Column

[24] Our earlier findings show, however, that Longholder CEOs are less likely to issue equity, conditional on doing a public issue. One potential explanation for why we find this earlier result in a framework even without firm fixed effects is that Longholder CEOs may use less private debt financing than other CEOs. It is also possible that Longholder CEOs issue public equity to finance larger investments than other CEOs, reinforcing the importance of controlling for financing needs.

[25] Note that even with conservative debt policy, leverage of overconfident CEOs may be higher than for rational CEOs since overconfident CEOs prefer to forgo equity issues entirely.

2 adds CEO-level controls, and Column 3 adds the full set of firm-level controls and industry dummies from Graham (2000).[26] Among the controls, we find some evidence that more vested option holdings are associated with lower kinks. Of Graham's 19 firm-level and industry controls, 16 have qualitatively similar effects in his and our estimations. The exceptions are negative owners' equity, the natural log of sales and advertising expense over sales, all of which have opposite signs.[27] Most importantly, Longholder CEOs have significantly higher kinks across specifications. The coefficient estimates range from 0.647 to 1.256, representing a 16% to 32% increase in kink from its mean and an increase of 0.24 to 0.46 standard deviations.

Overconfidence also predicts that the debt conservatism of Longholder CEOs reflects high reliance on internal resources, rather than low internal and high equity financing. As a first test of this prediction, we add an indicator for "Low Cash Status" and its interaction with Longholder (Column 4). Low Cash Status is equal to 1 if the firm's cash stock at the beginning of the year, divided by mean industry investment, is at or below the 40th percentile in our sample.[28] Mean industry investment is calculated separately for each year and each Fama-French industry shown in Panel A of Table 1. We find no evidence of higher kinks among Longholder CEOs with low internal funds. Only Longholder CEOs with abundant cash have significantly higher kinks than rational CEOs (coefficient = 0.85, p = 0.025). While the difference in kinks between Longholders with and without low cash is insignificant (p = 0.214), the result confirms that high kinks are not driven by CEOs who cannot use internal funds and need to raise equity to finance investment. We measure equity issuance directly in Table 6.

One shortcoming of the tobit analysis is that we cannot include firm fixed effects without biasing the coefficient estimates due to the incidental parameters problem. To address alternative explanations which rely on (uncontrolled) cross-sectional differences between firms with and without Longholder CEOs, we replicate our findings in a logit framework, with kink > 1 as the dependent variable (untabulated). Using conditional logit, we obtain consistent estimates including firm fixed effects. This specification identifies the Longholder effect using only differences in kink across Longholder and non-Longholder CEOs within the same firm. The results

[26] Graham also includes squares of all continuous controls. Including the squares has little impact on the results: The estimated Longholder coefficient in Column 3 changes from 0.605 to 0.611 (p = 0.051).

[27] The (untabulated) control variables are statistically significant with the exception of Negative Owners' Equity, CYCLICAL, Quick Ratio, and PPE-to-Assets.

[28] The results are robust to using other cutoffs, such as the 25th or the 30th percentile, or alternative proxies for "expected volume of investment," such as prior-year averages.

are larger in economic magnitude though weaker statistically when including firm effects, all controls, Low Cash, and Low Cash interacted with Longholder (Longholder p = 0.116). The Longholder coefficient is significant at the 5% or 10% level using the four specifications from Table 5 in the logit framework (i.e. without firm fixed effects).

Overall, Longholders appear to use debt more conservatively than other CEOs, particularly when cash reserves are abundant.

We also test directly whether Longholder CEOs do fewer equity issues as their firms' kinks increase, consistent with aversion to external finance and the overconfidence hypothesis. In Table 6, we tabulate the distribution of net equity issues among Longholder CEOs, separately for four different levels of "kink": (i) kink ≤ 1, (ii) $1 <$ kink ≤ 3, (iii) $3 <$ kink ≤ 7, and (iv) kink > 7. Comparing across groups, we find that higher levels of kink are associated with less equity issuance. As kink increases, both the mean and median of net equity issuance decline monotonically. The differences in mean equity issues between groups (i) and (ii) and groups (i) and (iii) have p-values of 0.016 and 0.052, respectively (clustering errors at the firm level). The remaining cross-group differences are not statistically significant.

Thus, Longholder CEOs who display debt conservatism are also less likely to issue equity. Instead, they appear to rely more on internal finance. It is also possible that Longholder CEOs store debt capacity in anticipation of large investments or acquisitions (thereby inducing high kinks). This explanation would be consistent with the evidence in Malmendier and Tate (*forthcoming*) that overconfident CEOs do more acquisitions and prefer to finance them with cash and debt.

Finally, we analyze the relation between the credit-worthiness of firms and their kinks. This analysis addresses two concerns. First, the high degree of debt conservatism among overconfident CEOs may simply reflect bad credit ratings. Second, if overconfident CEOs have particularly good ratings, high kinks might imply that they could issue additional, nearly riskless debt.[29] But overconfident CEOs should not be reluctant to issue riskless debt, since there is no disagreement about the appropriate price (interest rate). To test whether either extreme of credit-worthiness is driving our results, we use the S&P Long-Term Domestic Issuer Credit

[29] Note, however, that kinks greater than 1 do not automatically imply spare riskless debt capacity since states with negative earnings realizations result in no tax benefits regardless of the interest level, shifting down both the flat and declining portions of the expected marginal benefit curve.

Rating to split the sample of firm years into thirds: firms with A+ ratings or better are in the highest third and firms with BBB ratings or worse are in the lowest third. We drop firms with missing credit ratings. Repeating the tobit analysis of Table 5 on each subsample, we find that the effect is almost entirely concentrated in the middle third: the coefficients and p-values for Longholder in the Column III specification are .489 (0.32), 0.823 (0.018), and 0.412 (0.178) for low, middle, and high credit ratings. Thus, our findings neither reflect limited access to debt markets nor a failure to raise riskless debt. They also confirm that overconfidence cannot explain why certain large, credit-worthy companies abstain from issuing debt entirely.

We find similar results using Holder 67 as the proxy for Δ. We also find little consistent evidence of differences across the Pre- and Post-Longholder portions of the Longholder measure. The results using the TOTALconfident proxy, however, are quite different. TOTALconfident CEOs appear to have lower kinks than other CEOs, though the result is not robust to the fixed effects logit specification. This result is not surprising given our finding in Table 2 that only TOTALconfident CEOs are associated with a significantly higher probability of public debt issuance. One possible interpretation for the difference in results is that the portfolio measures identify a more extreme perception of undervaluation.

IV.B.3 Leverage

The results thus far confirm Hypotheses 1 and 2: CEOs we classify as overconfident prefer debt to equity conditional on accessing external finance and prefer internal to external finance, resulting in debt conservatism. Next we ask whether these patterns in financing choices accumulate into significant differences in capital structures.

Recent research argues that there are large unexplained time-invariant effects in leverage (Lemmon et al (2008)). One interesting question is the extent to which stable managerial traits, like latent overconfidence, might explain these differences across firms: Do firms with long-serving overconfident CEOs have systematically higher leverage than other firms? Unfortunately, it is difficult to assess causality in such cases and, specifically, to determine whether the effect is due to the manager or to the firm. For example, firms which follow more aggressive policies – evidenced by a higher "target" leverage ratio – may also be attractive places for overconfident CEOs to work. Thus, to isolate the impact of managerial beliefs on leverage, we follow

an approach similar to Bertrand and Schoar (2003). In particular, we identify the effect of managerial overconfidence by comparing firm leverage under overconfident and rational CEOs operating the same firm.

We estimate the following regression:

$$\text{Leverage}_{it} = \beta_1 + X'_{it}B_2 + \beta_3\Delta_{it} + \epsilon_{it} \tag{7}$$

where X is a vector of firm and CEO control variables.

We begin by estimating two baseline regressions for comparison with existing literature. In Column 1 of Table 7, we estimate a pooled regression, including our standard set of firm-level controls: profitability, tangibility, size, Q, and the financing deficit. Standard errors are clustered at the firm level. The controls explain 34% of the variation in leverage and have the typical directional effects: size (+), profitability (-), tangibility (+), Q (-), and financing deficit (+).[30] In Column 2, we add firm fixed effects. Consistent with Lemmon et al (2008), we find that adding firm effects more than doubles the R^2 of the regression. Among the controls, only tangibility loses explanatory power when estimated using within-firm variation.

Next, we ask whether differences in managerial confidence levels can explain remaining within-firm variation in leverage. We find that Longholder CEOs maintain significantly higher leverage than their predecessors or successors (Column 3). The effect is robust to the inclusion of several important controls. In Column 4, we add five lags of stock returns to capture the impact of stock prices changes on leverage ratios (Welch (2004)).[31] As expected, stock returns have a negative impact on leverage. The effect decays as we increase the lag length, with the fifth lag only ever marginally significant, economically or statistically. Notice that including stock returns also eliminates the predictive power of Q for leverage, while improving the R^2 of the regression. In Column 5, we add our standard CEO controls for stock and option holdings. If variation in inside information over time explains within-firm variation in leverage, then these controls can capture variation in CEOs' concern over diluting their personal equity stakes through new issues. In Column 6, we add CEO tenure and its interaction with Longholder to

[30] *Note that we include the financing deficit mainly for consistency with our earlier specifications and it is indeed significant; however, the Longholder effect does not depend upon its inclusion.*

[31] *We do not include contemporaneous returns in the tabulated regressions due to endogeneity concerns; however, the results are also robust to this additional control.*

the regression. We find a negative coefficient on the interaction and an increase in the (positive) level effect of Longholder. There are two potential explanations for this effect. Longholder CEOs may exhaust their firms' debt capacities early in their tenures and subsequently finance desired (over-) investment using equity. Alternatively, Longholder CEOs may learn to issue risky capital more appropriately as their tenures increase. Finally, in Column 7, we add year effects to the regression, finding only a small decline in the Longholder coefficient. Economically, the effect of Longholder on leverage appears significant. Using the Column 5 specification, for example, replacing a rational CEO with an overconfident one increases leverage by 20% of a standard deviation or, alternatively, by 15% from its mean level.

We do a number of additional untabulated robustness checks, both of the regression specification and the methodology. First, we consider book rather than market leverage as the dependent variable. The results are qualitatively similar, though statistically weaker. For example, the coefficient estimate on Longholder is 0.042 with a t-statistic of 1.51 in the Column 7 specification. One potential reason for the discrepancy is that book equity – as a historical accounting measure – has only a noisy relation to the economic quantity of interest, the value of shareholders' cash flow claims. We also find similar results using alternative methodology inspired by Baker-Wurgler (2003); i.e., measuring the relation between the change in leverage and the number of overconfident sample CEO years (or, alternatively, "external finance weighted" overconfidence). Finally, we find similar results using the TOTALconfident proxy, with some notable differences. First, the relation between the overconfidence proxy is stronger in the cross-section than in the within-firm variation. Second, the relation is stronger when we remove within-CEO variation in the overconfidence proxy. (Thus, the most useful comparison appears to be between average leverage chosen by overconfident and rational CEOs within the same firm.) Finally, unlike the Longholder effect, the TOTALconfident effect is typically strongest using book, rather than market, leverage as the dependent variable.

Overall, the results support the predictions of the overconfidence hypothesis: overconfident CEOs appear to view equity financing as a last resort, resulting in measurable differences in firm leverage ratios from rational predecessors or successors. The results also support our more general hypothesis that managerial beliefs can help to explain variation in capital structure choices that cannot be explained by time-invariant firm differences or variation in traditional capital structure determinants. Though we cannot identify the effect econometrically (due to

joint determination), the evidence suggests that managerial factors may at least partially account for the time-invariant, firm-specific component of leverage uncovered in recent empirical studies.

V. Past Experiences and CEO Beliefs

Thus far, we have used active CEO decisions on their personal portfolios to elicit beliefs about future company performance. We also supplemented our measures of revealed beliefs using portrayal in the business press. In this section, we take an alternative approach to measuring CEO beliefs. We identify major early life experiences which are likely to shape CEOs' fundamental beliefs. In particular, we consider the financing choices of CEOs who grew up during the Great Depression and CEOs with military experience.

Before testing specific capital structure predictions, we use the press data, described in Section III., to measure outsiders' perceptions of these CEOs. Prior literature suggests that CEOs who experienced the Great Depression early in life have a preference for self-sufficiency which is likely to manifest itself in a conservative leadership style. Consistent with this story, we find a positive and significant correlation between coverage in the business press which portrays the CEO as "cautious," "practical," "reliable," "conservative," "frugal," or "steady" ("Cautious" coverage) and membership in the Depression cohort (Panel A, Table 8). CEOs with military service, on the other hand, tend to be more aggressive (or risk-tolerant). And, indeed, we find that, military service has a significant negative correlation with "Cautious" coverage. In Panel B of Table 8, we test these correlations in a regression framework, controlling for differential press coverage and CEO age. Despite the imprecision of the measures, the direction of the effects remains the same and the negative correlation between "Cautious" coverage and military service remains statistically significant.

We also measure the correlation of the background proxies with several firm- and CEO-level variables (Panel A, Table 8). We find that military CEOs are significantly more likely to make acquisitions.[32] However, there is no correlation between the Depression cohort and merger frequency. In terms of financing choices, Depression CEOs have significantly higher levels of

[32] *Note that this effect is robust to controlling for standard merger determinants like Q and cash flow in a logit regression.*

Graham's "kink," indicating that they access debt markets conservatively. They are also significantly less likely than other CEOs to issue equity, conditional on accessing public securities markets, and appear to have lower market leverage ratios. Military CEOs, on the other hand, do not show any particular aversion to debt markets. They are also significantly more likely to issue equity, conditional on accessing public markets. And, they appear to have higher leverage, though the correlation is not statistically significant, suggesting an overall aggressiveness in their financial policy. (We test these patterns in a more rigorous regression framework below.) Perhaps most interestingly, military CEOs have significantly worse operating performance and shorter tenures than other CEOs, while Depression CEOs have higher ROA and longer tenures. Overall, we find significant differences between Depression CEOs, CEOs with military service, and other CEOs. The directions of the effects are consistent with military experience as a proxy for (overly-) aggressive beliefs and early life experience during the Great Depression as a proxy for conservatism, as suggested by prior literature.

Next we use methodology from Section IV.B to test the impact of managerial belief differences – captured by military service or membership in the Depression cohort – on firm financial policies. We test first whether Depression CEOs indeed display a heightened preference for internal financing (Hypothesis 3). Note that, unlike overconfidence, conservative beliefs arising from early life experience during a macroeconomic crisis do not predict a misassessment of expected returns to investment. Thus, we do not have a prediction for investment policy. We also do not have a clear prediction for the choice between debt and equity conditional on accessing external markets or, ultimately, for the firm's leverage ratio. Thus, we focus on the empirical tests from Section IV.B.2, replacing the overconfidence proxy with an indicator for membership in the Depression cohort ("Depression Baby"). We find that Depression Babies have significantly higher levels of the kink variable, even including the full set of controls from Graham (2000) (Panel A, Table 9). Economically, the 0.5053 increase in kink represents a 13% increase from the overall sample mean. We also verify the higher kinks among Depression Babies do not come from substituting equity issuance for debt (Panel B, Table 9). To the contrary, we find that Depression Babies with the highest values of the kink variable are actually net repurchasers of company equity, on average. Overall, the results support the hypothesis that Depression Babies prefer to minimize their exposure to capital markets.

Next, we test whether CEOs with a military background pursue more aggressive financial

policies (Hypothesis 4). Higher risk tolerance, for example, implies heightened use of debt financing conditional on accessing risky capital and, ultimately, higher leverage. The same mechanism is likely to lead to heightened investment.[33] Here, though, we focus on differences in firm leverage ratios, using the methodology of Section IV.B.3. We do not report results using the equity issuance or financing deficit frameworks, and rely on (changes in) leverage ratios to summarize capital structure relevant variation. In Column 1 of Table 10, we compare leverage chosen by CEOs with prior military service to the leverage chosen by their predecessors and/or successors in their firms. That is, we identify the impact of military service on leverage controlling for time-invariant differences across firms in capital structure policies. We confirm that military CEOs choose higher significantly leverage. Economically, the effect is smaller than the impact of overconfidence, increasing leverage 13% from its mean, or by roughly 17% of a standard deviation. In Column 2, we add our standard set of firm-level controls – profitability, tangibility, firm size, Q, and the financing deficit – and CEO-level controls for age and tenure with little impact on the coefficient on past military service. In untabulated regressions, we also confirm the robustness of the effect to the inclusion of lags of stock returns, as in Table 7. In Column 3, we interact military service with CEO tenure. Interestingly, we find, unlike overconfidence, that the impact of military service on leverage increases with tenure. In Column 4, we estimate the marginal impact of being a World War II veteran. We find that the impact of military service on leverage choices comes primarily from this group. Among World War II veterans, chosen leverage is 25% higher than the sample mean. This result is consistent with the importance of combat exposure in shaping individual risk attitudes and beliefs. It also suggests the importance of achieving a major victory in reinforcing those beliefs. It is less consistent, though, with a self-selection mechanism under which aggressive or risk-tolerant individuals choose to serve in the military (and then later take more aggressive decisions as CEOs), as non-voluntary service was common during World War II. Finally, in Column 5, we include both background proxies – Depression Baby and Army – together with the Longholder overconfidence measure and portfolio controls. Both the Longholder and Army variables remain positive and significant, suggesting that they capture the behavior of different subsets of CEOs and/or different types of beliefs. The Depression Baby variable has no significant relation with leverage. Overall, the results indicate the importance of managerial beliefs and characteristics

[33] *Note that we did find evidence of heightened investment among military CEOs in Table 8. Indeed, the ROA results suggest that military CEOs may even overinvest.*

in determining firm-level financial choices.

VI. Conclusion

We identify the impact of managerial beliefs on firm financial policies, separately from traditional market-, industry-, and firm-level factors. We begin by using CEO portfolio choices to measure variation in their beliefs about future company performance. We consider several explanations for persistent late option exercise – including positive inside information – and show that it is most consistent with CEO overconfidence. We also verify our measure of revealed beliefs by confirming that such CEOs are disproportionately characterized by the business press as "confident" or "optimistic," rather than "reliable," "cautious," "practical," "conservative," "frugal," or "steady."

This form of belief makes specific capital structure predictions: Overconfident CEOs overestimate future cash flows and, therefore, perceive external financing – and particularly equity – to be unduly costly. Thus, they prefer internal financing over external capital markets and, conditional on raising risky capital, debt over equity. We find strong evidence that, conditional on accessing public securities markets, overconfident CEOs are less likely to issue equity than other CEOs. We also find that, to cover an additional dollar of external financing deficit, overconfident CEOs issue about 33 cents more debt than their peers. Managerial overconfidence is also positively related to debt conservatism, measured using the "kink" variable from Graham (2000). This debt conservatism is not driven by an increased propensity to issue equity; instead, overconfident CEOs rely excessively on internal funds. Finally, overconfident managers choose higher leverage ratios than predecessors or successors in their firms.

In addition to exploiting the observable differences in beliefs revealed by option exercise choices and press portrayal, we consider differences in early life experiences which are likely to shape beliefs and choices in later life. Guided by prior psychology and management literature, we focus on two major formative experiences which affect sample CEOs: living early life during the Great Depression and serving in the military. We find that CEOs who experience the Great Depression early in life display a heightened reluctance to access external capital markets. Military CEOs, on the other hand, choose more aggressive corporate policies, including higher leverage ratios. The effects are distinct from the impact of overconfidence on financial decisions.

Our results have a number of important implications. First, our results may provide a (partial) explanation for the strong time-invariant component of firm capital structure identified by recent studies. Though our identification strategy requires us to establish the impact of managerial beliefs independently from these effects (i.e. using only within-firm variation), the significance of our measures suggests that variation in managerial beliefs may account for a significant portion of the co-determined between-firm variation. Managerial beliefs may be particularly important in firms with long-serving managers, family ownership, or a preference for hiring managers with a particular "style."

Second, our results have distinct implications for contracting practices and organizational design. Standard incentives, such as stock- and option-based compensation, are unlikely to mitigate the effects of managerial overconfidence on investment and financing decisions. As a result, the board of directors may need to use different tools, such as cash dividend payment and debt overhang, to constrain overconfident CEOs.

Finally, we find evidence that major, personal life events shape future decision made by CEOs. Macroeconomic shocks, like the current financial crisis, are likely to not only have an immediate impact on corporate financial policies (e.g. through de-leveraging and a shift toward self-sufficiency), but may also have an impact on future corporate policies as today's young investors, who are being introduced to financial markets during a time of major crisis, become the next generation of corporate leaders. Thus our Depression Baby results, in particular, not only document a pattern of historical interest, but also suggest a pattern in financial choices which may play out over the coming decades.

VII. Appendix A

Proof of Proposition 1. The participation constraint of new shareholders requires s' to satisfy

$$\frac{s'}{s+s'}\left\{E[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]+A+C-c\right\}=I-c$$

Thus, the manager's perception of the value of current shareholder claims is

$$\begin{aligned} G &= \left(1-\frac{s'}{s+s'}\right)\left\{\widehat{E}[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]+\widehat{A}+C-c\right\} \\ &= \frac{\widehat{E}[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]+\widehat{A}+C-c}{E[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]+A+C-c}\left\{E[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]+A+C-I\right\} \end{aligned}$$

Then

$$\begin{aligned} \frac{\partial G}{\partial c} &= \frac{\left\{\widehat{E}[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]-E[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]\right\}+\left(\widehat{A}-A\right)}{\left\{E[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]+A+C-c\right\}^2}\cdot \\ &\quad \left\{E[\tilde{R}-\tau\mathbf{1}_{\{R>I\}}(\tilde{R}-I)]+A+C-I\right\} \end{aligned}$$

Notice that the numerator of the fraction is positive by assumption. So, $\frac{\partial G}{\partial c}>0$ if and only if $E[\tilde{R}-\tau 1_{\{R>I\}}(\tilde{R}-I)]+A+C-I>0$. But, $s>0$ implies $\frac{s'}{s+s'}<1$. So, the result follows from the new shareholders' participation constraint. Perceived value is maximized on $c\in[0,I]$ by setting c as high as possible. The relation is weak because rational CEOs are indifferent among all financing plans while overconfident CEOs strictly prefer internal finance. **Q.E.D.**

Proof of Proposition 2. For notational simplicity, define $Q\equiv E[(\tilde{R}-\tau 1_{\{R>I\}}(\tilde{R}-I-[w-d])-w)^+]$. Using the participation constraint for shareholders (2) and the fact that $E[\cdot]=\hat{E}[\cdot]$ for rational CEOs, we can re-write the maximand as $Q-(I-d)$.

We consider separately the case in which the CEO uses at least some risky debt ($w>d>R_B$) and the case in which the CEO uses no risky debt, $w=d=R_B$. The latter case is the lower boundary of (4).

In the first case, i.e. if $w>R_B$, the firm defaults in the bad state and hence

$$\begin{aligned} Q &= (1-\tau)pR_G+p\tau I-(1-\tau)pw-p\tau d \qquad (8) \\ \Longleftrightarrow Q-(I-d) &= (1-\tau)pR_G-(1-p\tau)I-(1-\tau)pw+(1-p\tau)d. \end{aligned}$$

Using (3) to substitute for w, the maximand becomes:

$$Q-(I-d)=(1-\tau)pR_G-(1-p\tau)I+(1-\tau)(1-p)(R_B-L)+\tau(1-p)d. \qquad (9)$$

Since d enters positively, value is maximized by setting d as high as possible. Thus, given boundary (4), the optimal level of debt is $d^*=I$. Substituting back into the maximand yields

$$Q-(I-d^*)=(1-\tau)[pR_G+(1-p)(R_B-L)-I].$$

In the second case, $w = R_B$, the firm uses only riskless debt and equity. Thus, there is no default, and we have:

$$\begin{aligned} Q &= (1-\tau)pR_G + p\tau I + (1-p)R_B - d \quad (10) \\ \iff Q-(I-d) &= (1-\tau)pR_G - (1-p\tau)I + (1-p)R_B \quad (11) \end{aligned}$$

Comparing the value function at the two boundaries, we find that the manager will choose full debt financing if:

$$(1-\tau)[pR_G + (1-p)(R_B - L) - I] > (1-\tau)pR_G - (1-p\tau)I + (1-p)R_B, \quad (12)$$

which simplifies to $\frac{\tau(I-R_B)}{1-\tau} > L$. For the reverse inequality, the manager will choose full equity financing, and he is indifferent in the case of equality. **Q.E.D.**

Proof of Proposition 3. Let $Q \equiv E[(\tilde{R} - \tau \mathbf{1}_{\{R>I\}}(\tilde{R} - I - [w-d]) - w)^+]$. Denote as $\widehat{Q}$ an overconfident manager's perception of Q. Then, $\widehat{Q} = Q + p(1-\tau)\Delta$. Using (2), we can write the objective function of the overconfident CEO's maximization problem as $[Q-(I-d)]\frac{\widehat{Q}}{Q}$.

Consider first the case that the CEO uses at least some risky debt ($w > d > R_B$). Then, using equations (8) and (9) and constraint (3), the maximand becomes

$$\begin{aligned} [Q-(I-d)]\frac{\widehat{Q}}{Q} &= [Q-(I-d)]\left[1 + \frac{p(1-\tau)\Delta}{Q}\right] \\ &= [(1-\tau)pR_G - (1-p\tau)I + (1-\tau)(1-p)(R_B - L) + \tau(1-p)d] \cdot \\ &\quad \left[1 + \frac{p(1-\tau)\Delta}{(1-\tau)pR_G + p\tau I - (1-\tau)[d-(1-p)(R_B-L)] - p\tau d}\right] \end{aligned}$$

Differentiating with respect to d yields

$$\frac{\partial}{\partial d}\left[\frac{Q-(I-d)}{Q}\widehat{Q}\right] = \tau(1-p) + \frac{\tau(1-p)p(1-\tau)\Delta}{Q} + \frac{p(1-\tau)\Delta\left[(1-\tau)+p\tau\right]}{Q^2}\left[Q-(I-d)\right].$$

The derivative is strictly positive if $Q > 0$ (and hence $Q - (I-d) = s/(s+s')Q > 0$). We know that $Q \geq 0$ since it is defined as the expectation over values truncated at 0 ($Q \equiv E[(\tilde{R} - \tau 1_{\{R>I\}}(\tilde{R} - I - [w-d]) - w)^+]$). Since $Q = p[(1-\tau)(R_G - w) + \tau(I-d)]$ in the case of risky debt by (8), $R_G - w \geq 0$ ($w > R_G$ yields lower payoffs to bondholders and stockholders than $w = R_G$ due to default costs in both states), and $I - d \geq 0$ by (4), $Q = 0$ if and only if $R_G - w = 0$ and $I - d = 0$. Thus, we have either $Q > 0$, in which case the derivative is strictly positive and the manager sets d as high as possible, $d^* = I$, or $Q = 0$, which occurs also for $d = I$. In either case, the maximand becomes:

$$[Q-(I-d)]\frac{\widehat{Q}}{Q} = \widehat{Q} = (1-\tau)[pR_G + (1-p)(R_B - L) - I] + p(1-\tau)\Delta$$

Now consider the case that $w = d = R_B$. Then, the firm finances I using only riskless debt

and equity. There is no default and using (10) and (11) the maximand becomes

$$\begin{aligned}[Q-(I-d)]\frac{\widehat{Q}}{Q} &= [Q-(I-d)]\left[1+\frac{p(1-\tau)\Delta}{Q}\right] \\ &= [(1-\tau)pR_G-(1-p\tau)I+(1-p)R_B]\cdot \\ &\quad \left[1+\frac{p(1-\tau)\Delta}{(1-\tau)pR_G+(1-p)R_B-R_B+p\tau I}\right]\end{aligned}$$

Comparing the values of the objective function using the optimal amount of risky debt and all equity, we find that the manager chooses risky debt financing if and only if

$$\begin{aligned}&(1-\tau)[pR_G+(1-p)(R_B-L)-I]+p(1-\tau)\Delta \\ > \quad &\left[1+\frac{p(1-\tau)\Delta}{(1-\tau)pR_G+(1-p)R_B-R_B+p\tau I}\right][(1-\tau)pR_G-(1-p\tau)I+(1-p)R_B]\end{aligned}$$

Or,

$$\tau(1-p)(I-R_B)+\left\{p(1-\tau)\Delta\left[1-\frac{(1-\tau)pR_G+(1-p)R_B-I+p\tau I}{(1-\tau)pR_G+(1-p)R_B-R_B+p\tau I}\right]\right\}>(1-\tau)(1-p)L$$

Comparing this condition to condition (12) in Proposition 1, we see that the overconfident CEO will be more likely to use debt if and only if the term in { } is positive. Since $I > R_B$ by assumption, the term in [ ] is positive, yielding the result. **Q.E.D.**

VIII. Appendix B

We consider several alternative interpretations of our measures. We exclude explanations for late option exercise that have little or no bearing on the press measure. For example, personal taxes, board pressure and procrastination are potential explanations for late option exercise, but have no plausible effect on CEOs' portrayal in the business press. To address these stories, we rely on the robustness of our results across the two measures.

Dilution. CEOs with extensive holdings of company stock and options may care about diluting those holdings by issuing additional equity. Graham and Harvey (2001), for example, report that earnings-per-share dilution is a primary managerial consideration when considering a stock issue. We include direct controls for the level of CEO holdings in our estimations to address this concern – our portfolio measures target the timing of option exercise and not the level of CEO holdings. Note also that perceived dilution is the mechanism which causes overconfident CEOs, who overestimate firm value, to avoid issuing equity. However, real dilution occurs only when there is an information asymmetry between management and the market about firm value. Below, we consider directly the impact of positive inside information on our measures.

Inside Information CEOs may choose not to exercise in-the-money options because they have private information that the firm's future earnings will be strong. Then, holding company stock options is a profitable investment opportunity until outsiders learn the information and incorporate it into prices. Moreover, CEOs with such information may justifiably exude "confidence" and "optimism" to outsiders, including the business press. In this case, our results would support the traditional information-based explanation of pecking order financing. The key distinction between this story and overconfidence is whether CEOs' beliefs are correct.

We check whether CEOs earn positive abnormal returns from holding options beyond the calibrated thresholds. We find that Longholder CEOs would earn greater profits on average by exercising 1, 2, 3, or 4 years earlier and investing in the S&P 500 for the remainder of the options' durations.[34] We find similar evidence for the Holder 67 measure. Thus, the evidence suggests that the average CEO who holds company stock options beyond calibrated thresholds for exercise does not have positive inside information.

Signalling. The apparent absence of inside information makes a rational signalling interpretation of our measures difficult. If late option exercise and bold statements to the press are signals of strong future stock price performance, those signals seem ineffective: CEOs who send them are the least likely to issue equity and their stock does not display positive abnormal performance. On the other hand, investors might have expected worse future performance in the absence of option-holding and strong statements in the press, leading to even less equity issuance. Our findings using the Post-Longholder measure cast some doubt on this interpretation. If private information drives managerial financing preferences for debt over equity and delayed option exercise (and press coverage) signals that information to the market, we would expect a weaker impact of past 'signals.' Instead, we find little difference between the effects of past and contemporaneous late exercise on financing choices.

Risk Tolerance. CEOs with greater risk tolerance may hold options longer since they are more willing to expose their personal wealth to company-specific risk. They may also appear more "confident" and "optimistic" and less "cautious," "conservative," "practical," "reliable," or "steady" to business reporters. In addition, bankruptcy is less of a deterrent to issuing debt for risk-seeking CEOs. However, risk tolerance does not predict aversion to external financing.

[34] See Malmendier and Tate (2004) for detailed tables.

Thus, our debt conservatism results in Section IV.B.2 will be difficult to reconcile with this story.

Thus, each of these interpretations is difficult to reconcile with some of the evidence. Overestimation of future performance, instead, is consistent with all of our findings. For the remainder of the paper, we interpret Longholder, Holder 67, and TOTALconfident as overconfidence measures. The main insight, however, is independent of this interpretation: systematic and measurable differences in CEO beliefs predict systematic differences in financial policies.

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Figure 1. Model Predictions (Stylized Example)

The hypothetical example illustrates how overconfident CEOs deviate from the rational benchmark in their average financing of investment projects, as predicted by the theory. Relative to the (hypothetical) rational benchmark of 1/3 cash, 1/3 debt, and 1/3 equity financing, overconfident CEOs choose a lower absolute amount of debt financing (2/9 <1/3) but a higher leverage (2/3 > 1/2).

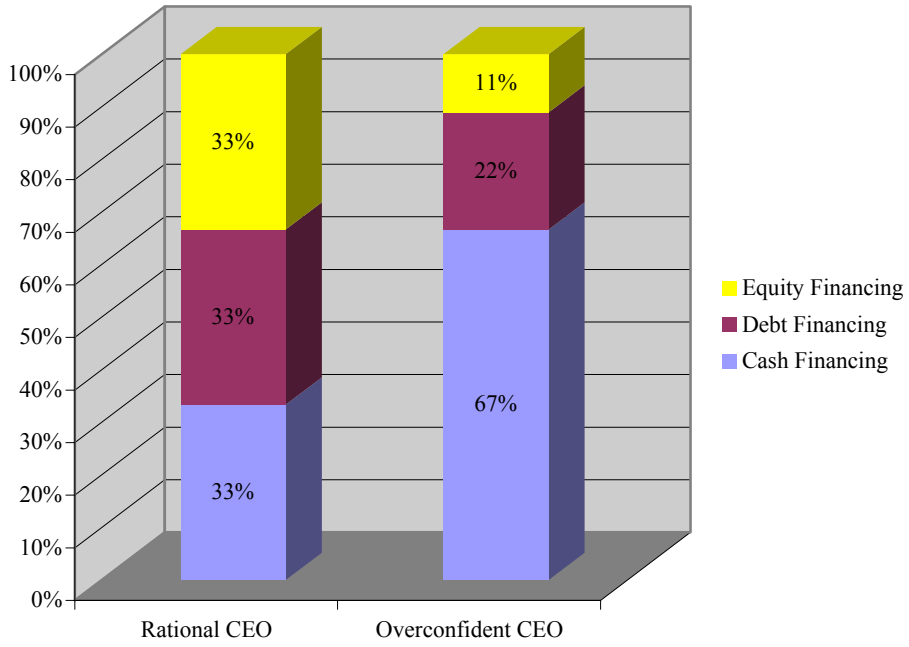

Table 1. Summary Statistics

Panel A. Financing Deficit Variables

Net financing deficit is cash dividends plus net investment plus change in working capital minus cash flow after interest and taxes. Net investment is capital expenditures plus increase in investments plus acquisitions plus other uses of funds minus sale of property, plants, and equipment minus sale of investment. Change in working capital is change in operating working capital plus change in cash and cash equivalents plus change in current debt. Cash flow after interest and taxes is income before extraordinary items plus depreciation and amortization plus extraordinary items and discontinued operations plus deferred taxes plus equity in net loss (earnings) plus other funds from operations plus gain (loss) from sales of property, plants, and equipment and other investments. Net debt issues are long term debt issuance minus long term debt reduction. Net equity issues are sales of common stock minus stock repurchases. Profitability is operating income before depreciation, normalized by assets at the beginning of the year. Tangibility is property, plants, and equipment, normalized by assets at the beginning of the year. Q is the market value of asset over the book value of assets, where market value of assets is the book value of assets plus market equity minus book equity. Δ denotes one-year changes. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year.

	Full Sample						Longholder Sample					
	Number of Firms = 263						Number of Firms = 56					
Variable	Obs.	Mean	Median	SD	Min.	Max.	Obs.	Mean	Median	SD	Min.	Max.
Assets ($m)	2385	5476.92	2111.96	13389.44	39.64	198598.70	463	4820.30	2111.78	8763.07	48.79	79262.00
Net Financing Deficit ($m)	2385	42.67	0.75	538.56	-6800.30	8845.50	463	10.41	-1.05	287.07	-845.00	1698.00
Cash Dividends ($m)	2385	109.47	35.58	239.77	0.00	2487.00	463	126.59	40.69	252.09	0.00	1870.00
Net Investment ($m)	2385	502.28	172.70	1311.81	-2930.00	26523.00	463	498.57	207.37	1070.84	-577.00	9755.00
Change in Working Capital ($m)	2385	26.73	16.02	790.77	-21767.00	16224.00	463	35.54	17.95	347.04	-2920.50	2675.00
Cash Flow after Interest and Taxes ($m)	2385	595.80	228.56	1276.57	-1678.44	20278.00	463	650.29	254.62	1243.20	-1678.44	11273.00
Net Financing Deficit/$Assets_{t-1}$	2385	0.03	0.00	0.16	-0.63	2.56	463	0.02	0.00	0.14	-0.24	1.60
Net Debt Issues/$Assets_{t-1}$	2385	0.01	0.00	0.08	-0.62	0.92	463	0.01	0.00	0.06	-0.15	0.36
Net Equity Issues/$Assets_{t-1}$	2155	0.00	0.00	0.08	-0.77	1.85	413	0.01	0.00	0.09	-0.30	1.18
Profitability	2385	0.18	0.17	0.11	-0.24	0.99	463	0.21	0.19	0.12	-0.03	0.88
Δ Profitability	2385	0.00	0.00	0.06	-0.76	0.98	463	0.00	0.00	0.08	-0.51	0.98
Tangibility	2385	0.44	0.42	0.22	0.00	2.08	463	0.46	0.43	0.21	0.06	2.08
Δ Tangibility	2385	-0.05	-0.03	0.11	-1.47	0.54	463	-0.05	-0.03	0.12	-1.47	0.16
Q	2385	1.61	1.30	1.01	0.59	12.26	463	1.70	1.44	1.02	0.77	10.71
Δ Q	2385	0.01	0.01	0.50	-7.18	5.04	463	0.03	0.02	0.42	-1.81	4.32
ln(Sales)	2385	7.90	7.82	1.12	3.18	11.93	463	7.89	7.87	1.18	3.18	11.23
Δ ln(Sales)	2385	0.08	0.07	0.19	-2.04	1.67	463	0.09	0.08	0.17	-0.55	1.67

Distribution across Fama French 12 Industry Groups

	(2381 observations)			*(463 observations)*			
Consumer Nondurables	0.13	Telecommunication	0.06	Consumer ND	0.11	Telecommunication	0.02
Consumer Durables	0.05	Utilities	n/a	Consumer Durables	0.03	Utilities	n/a
Manufacturing	0.18	Shops	0.14	Manufacturing	0.16	Shops	0.14
Energy	0.04	Health	0.06	Energy	0.00	Health	0.09
Chemicals and Allied Products	0.08	Money	n/a	Chemicals	0.16	Money	n/a
Business Equipment	0.09	Other	0.18	Business Equipment	0.13	Other	0.17

The Fama-French Industry Groups are defined on French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

Table 1 (cont.)

Panel B. Kink Variables

Kink is the amount of interest at the point where the marginal benefit function becomes downward sloping, as a proportion of actual interest expense. ECOST is the standard deviation of the first difference in taxable earnings divided by assets, the quoteient times the sum of advertising, research, and development expenses divided by sales. CYCLICAL is the standard deviation of operating earnings divided by mean assets first calculated for each firm, then averaged across firms within two-digit SIC codes. Return on assets is income before extraordinary items plus interest expense plus depreciation, divided by assets. Z-score is 3.3 times the difference of operating income before depreciation and depreciation plus sales plus 1.4 times retained earnings plus 1.2 times working capital (balance sheet), the quantity divided by assets. Quick ratio is the sum of cash and short-term investments and total receivables divided by total current liabilities. Current ratio is total current assets divided by total current liabilities. Q-ratio is preferred stock plus market value of common equity plus net short-term liabilities, the quantity divided by assets. R&D to sales and Advertising to sales are set to 0 when the numerator is missing. Computer Industry are all firms with SIC code 357, Semiconductor Industry all firms with SIC code 367, Chemicals and Allied Products comprises SIC codes 280-289, Aircraft and Guided Space Vehicles SIC codes 372 and 376, and Other Sensitive Industries SIC codes 340-400, excluding 357, 367, 372, and 376. Vested options (as a % of shares outstanding) are multiplied by 10 so that the means of vested options and stock ownership are the same order of magnitude. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year.

	Full Sample						Longholder Sample					
	Number of Firms = 189						Number of Firms = 44					
Variable	Obs.	Mean	Median	SD	Min.	Max.	Obs.	Mean	Median	SD	Min.	Max.
Kink	1726	3.93	3	2.74	0	8	377	4.59	4	2.75	0	8
I(No dividend)	1726	0.12	0	0.33	0	1	377	0.17	0	0.38	0	1
I(Negative owners' equity)	1726	0.01	0	0.12	0	1	377	0	0	0	0	0
I(NOL carryforward)	1726	0.15	0	0.36	0	1	377	0.14	0	0.35	0	1
ECOST	1726	1.74	0.65	3.21	0	18.92	377	2.36	0.79	3.92	0	18.92
CYCLICAL	1726	0.07	0.07	0.03	0.02	0.18	377	0.08	0.07	0.02	0.04	0.18
Return on assets	1726	0.13	0.14	0.05	-0.06	0.27	377	0.14	0.14	0.05	-0.06	0.27
ln(sales)	1726	7.88	7.82	1.01	5.49	10.32	377	7.93	7.87	1.07	5.49	10.32
Z-score	1726	2.51	2.34	1.17	0.38	7.07	377	2.74	2.51	1.24	0.79	7.07
Quick ratio	1726	1.08	0.89	0.74	0.16	4.92	377	1.12	0.94	0.71	0.16	4.92
Current ratio	1726	1.88	1.63	0.96	0.57	6.02	377	1.97	1.71	0.94	0.58	6.02
PPE-to-assets	1726	0.42	0.40	0.18	0.06	0.81	377	0.41	0.39	0.16	0.06	0.81
Q-ratio	1726	1.12	0.88	0.78	0.15	4.58	377	1.22	0.99	0.83	0.15	4.58
R&D-to-sales	1726	0.02	0.01	0.03	0	0.16	377	0.03	0.02	0.04	0	0.16
Advertising-to-sales	1726	0.02	0	0.03	0	0.16	377	0.02	0.01	0.03	0	0.16
Computer Industry	1726	0.04	0	0.19	0	1	377	0.07	0	0.25	0	1
Semiconductor Industry	1726	0.02	0	0.14	0	1	377	0.03	0	0.16	0	1
Chemicals and Allied Products Industry	1726	0.14	0	0.35	0	1	377	0.21	0	0.41	0	1
Aircraft and Guided Space Vehicles Industry	1726	0.02	0	0.13	0	1	377	0.02	0	0.14	0	1
Other Sensitive Industries	1726	0.19	0	0.39	0	1	377	0.15	0	0.35	0	1

Panel C. CEO Variables

CEO Vested Options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a percentage of common shares outstanding and multiplied by 10 (so that the mean is roughly comparable to CEO Stock Ownership).

	Full Sample						Longholder Sample					
	Number of CEOs = 498						Number of CEOs = 58					
Variable	Obs.	Mean	Median	SD	Min.	Max.	Obs.	Mean	Median	SD	Min.	Max.
Age	2384	57.77	58	7.16	32	84	463	58.46	59	6.30	41	82
Tenure	2364	8.83	6	7.69	1	45	442	10.78	9	6.78	1	36
CEO Stock Ownership	2385	0.03	0.00	0.08	0	0.95	463	0.02	0.00	0.04	0	0.49
CEO Vested Options	2385	0.03	0.01	0.14	0	4.63	463	0.07	0.02	0.29	0	4.63

Table 2. Public Security Issues

Longholder is a binary variable, equal to 1 if the CEO, at some point during his tenure, held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. Post-Longholder is a dummy, equal to 1 for all CEO-years after the CEO for the first time holds options to expiration. Pre-Longholder is Longholder minus Post-Longholder. Holder 67 is a dummy equal to 1 for all CEO years after the CEO for the first time fails to exercise a 67% in the money option with 5 years remaining duration. In the Holder 67 regressions, the sample is limited to CEO years after the CEO for the first time had a 67% in the money option with 5 years remaining duration. TOTALconfident is a dummy variable equal to 1 when the number of "confident" and "optimistic" mentions for a CEO in the LexisNexis and Wall Street Journal searches exceeds the number of "not confident", "not optimistic", and "reliable, cautious, practical, conservative, steady, frugal" mentions. TOTALmentions is the total number of articles mentioning the CEO in both sets of searches. Both dummies consider all articles over the sample period up to the previous year. Data on public issues is from the SDC. There are 330 firms. Equity issues are issues of common stock or non-convertible preferred stock. Debt issues are issues of non-convertible debt. Hybrid issues are issues of convertible debt or convertible preferred stock. US Rule 144A issues are included. Standard errors are adjusted for clustering at the firm level.

	Years with a Security Issue	% of Issue Years with an Equity Issue	% of Issue Years with a Debt Issue	% of Issue Years with a Hybrid Security Issue
Longholder = 0	621	42%	57%	16%
Longholder = 1	141	31%	63%	19%
Pre-Longholder = 1	91	31%	63%	23%
Post-Longholder = 1	50	32%	64%	12%
Difference t (Longholder = 0 - Longholder = 1)		2.03**	0.85	0.85
Holder 67 = 0	95	39%	65%	21%
Holder 67 = 1	182	23%	73%	16%
Difference t		3.12***	1.18	1.04
TOTALconfident = 0	452	48%	47%	18%
TOTALconfident = 1	214	25%	79%	14%
Difference t		5.37***	6.77***	1.43

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3. Debt vs. Equity (I): Equity Issuance Logits

The sample consists of all firm years in which the firm did at least one public security issue. The dependent variable is binary and equals 1 if the firm issued equity during the fiscal year, where equity issues are SDC issues of common equity or non-convertible preferred stock. CEO Vested Options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a percentage of common shares outstanding and multiplied by 10 (so that the mean is roughly comparable to CEO Stock Ownership). Profitability is operating income before depreciation normalized by beginning of the year assets. Tangibility is property, plants, and equipment, normalized by beginning of the year assets. Q is the market value of assets over the book value of assets, where market value of assets is the book value of total assets plus market equity minus book equity. Book leverage is the sum of debt in current liabilities and long term debt, divided by the sum of the numerator and common equity. We exclude observations in which book leverage is negative or greater than 1. Stock, Vested Options, ln(Sales), Q, Profitability, Tangibility, and Book Leverage are measured at the beginning of the fiscal year. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. Kink Controls are defined as in Graham (2002) and include dummies for No Dividend, Negative Owners' Equity, and NOL Carryforward, where NOL means net operating loss; ECOST (the product of (1) the standard deviation of the first difference in taxable earnings divided by assets and (2) the sum of advertising, research, and development expenses divided by sales); CYCLICAL (the standard deviation of operating earnings divided by mean assets first calculated for each firm, then averaged for each two-digit SIC code); Return on Assets (income before extraordinary items plus interest expense plus depreciation, divided by assets); Z-Score (3.3 times the difference of operating income before depreciation and depreciation plus sales plus 1.4 times retained earnings plus 1.2 times working capital [balance sheet], divided by assets); Quick Ratio (sum of cash and short-term investments and total receivables divided by total current liabilities); Current Ratio (total current assets, divided by total current liabilities); Q-Ratio (preferred stock plus market value of common equity plus net short-term liabilities, divided by assets); R&D-to-Sales and Advertising-to-Sales. The final two variables are set to 0 when the numerator is missing. Industry Fixed Effects are the kink-regression industry dummies of Graham (2000); see Table 1, Panel B. All standard errors are adjusted for clustering at the firm level.

	Logit (1)	Logit (2)	Logit (3)	Logit (4)	Logit (5)	Logit (6)
Longholder	-0.469	-0.592	-0.534	-0.46	-0.457	-0.6695
	(1.94)*	(2.34)**	(2.10)**	(1.80)*	(1.66)*	(2.22)**
CEO Stock Ownership		-0.266	-0.996	-1.279	-0.655	-7.6403
		(0.16)	(0.59)	(0.72)	(0.34)	(2.35)**
CEO Vested Options		6.766	4.669	4.234	7.328	10.6238
		(3.43)***	(2.21)**	(2.14)**	(3.05)***	(2.81)***
ln(Sales)			-0.414	-0.437	-0.355	
			(3.79)***	(3.70)***	(2.84)***	
Q			-0.088	-0.074	0.139	
			(0.68)	(0.56)	(1.00)	
Profitability			-1.872	-1.493	-2.463	
			(1.53)	(1.21)	(1.74)*	
Tangibility			0.139	0.088	0.113	
			(0.30)	(0.19)	(0.23)	
Book Leverage				0.651	1.288	
				(1.14)	(2.07)**	
Kink Controls						X
Industry Fixed Effects						X
Year Fixed Effects					X	X
Observations	762	644	627	617	617	442
Number of Firms	330	174	171	171	171	135

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Debt vs. Equity (II): Financing Deficit Regressions

The dependent variable is Net Debt Issues normalized by beginning-of-the-year assets, where Net Debt Issues are long-term debt issues minus long term debt reduction. Net Financing Deficit is cash dividends plus net investment plus change in working capital minus cash flow after interest and taxes, normalized by beginning-of-the-year assets. Net investment is capital expenditures plus increase in investments plus acquisitions plus other uses of funds minus sale of PPE minus sale of investment. Change in working capital is change in operating working capital plus change in cash and cash equivalents plus change in current debt. Cash flow after interest and taxes is income before extraordinary items plus depreciation and amortization plus extraordinary items and discontinued operations plus deferred taxes plus equity in net loss (earnings) plus other funds from operations plus gain (loss) from sales of PPE and other investments. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. CEO Vested Options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a percentage of common shares outstanding and multiplied by 10 (making the mean roughly comparable to CEO Stock Ownership). The FD Control Variables are identical to those in Frank and Goyal (2003): changes in profitability (operating income before depreciation normalized by beginning of the year assets), in tangibility (property, plants, and equipment, normalized by beginning of the year assets), in the logarithm of sales and in Q (market value of assets over the book value of assets, where market value of assets is the book value of total assets plus market equity minus book equity). Book Leverage is debt in current liabilities plus long-term debt divided by the debt in current liabilities plus long-term debt plus common equity, measured at the beginning of the year. All standard errors are adjusted for clustering at the firm level.

	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Net Financing Deficit (FD)	0.729					
	(9.90)***					
Longholder		-0.006	-0.005	-0.008	-0.008	-0.005
		(1.43)	(1.37)	(1.95)*	(2.03)**	(1.43)
Longholder * FD		0.350	0.348	0.332	0.322	0.334
		(1.78)*	(1.77)*	(1.77)*	(1.69)*	(1.90)*
CEO Stock Ownership			0.015	0.015	0.014	0.010
			(0.87)	(0.90)	(0.85)	(0.76)
CEO Stock * FD			0.373	0.431	0.370	0.348
			(2.30)**	(2.63)***	(2.14)**	(2.17)**
CEO Vested Options			-0.025	-0.021	0.000	0.011
			(1.49)	(1.15)	(0.00)	(0.52)
CEO Vested Options * FD			-0.088	-0.098	-0.135	-0.156
			(3.21)***	(3.59)***	(3.06)***	(3.76)***
Book Leverage						-0.096
						(5.98)***
Book Leverage * FD						-0.129
						(0.54)
FD Control Variables					X	X
FD Control Variables * FD					X	X
Year Fixed Effects				X	X	X
Firm Fixed Effects		X	X	X	X	X
Firm Fixed Effects * FD		X	X	X	X	X
Observations	2385	2385	2385	2385	2385	2346
Number of Firms	263	263	263	263	263	262
R-squared	0.75	0.93	0.93	0.94	0.94	0.94

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Debt Conservatism: Kink Tobits

The dependent variable is the "kink" variable of Graham (2000). Kink is the amount of interest at which the marginal benefit function starts to slope down, as a proportion of actual interest expense. Longholder is a binary variable, equal to 1 if the CEO, at some point during his tenure, held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. CEO Stock Ownership is the percentage of company stock owned by the CEO and his immediate family at the beginning of the year. CEO Vested Options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a percentage of common shares outstanding and multiplied by 10 (so that the mean is roughly comparable to CEO Stock Ownership). Kink Controls are defined as in Graham (2002) and include dummies for No Dividend, Negative Owners' Equity, and NOL Carryforward, where NOL means net operating loss; ECOST (the product of (1) the standard deviation of the first difference in taxable earnings divided by assets and (2) the sum of advertising, research, and development expenses divided by sales); CYCLICAL (the standard deviation of operating earnings divided by mean assets first calculated for each firm, then averaged for each two-digit SIC code); Return on Assets (income before extraordinary items plus interest expense plus depreciation, divided by assets); Z-Score (3.3 times the difference of operating income before depreciation and depreciation plus sales plus 1.4 times retained earnings plus 1.2 times working capital [balance sheet], divided by assets); Quick Ratio (sum of cash and short-term investments and total receivables divided by total current liabilities); Current Ratio (total current assets, divided by total current liabilities); Q-Ratio (preferred stock plus market value of common equity plus net short-term liabilities, divided by assets); R&D-to-Sales and Advertising-to-Sales. The final two variables are set to 0 when the numerator is missing. Industry Fixed Effects are the kink-regression industry dummies of Graham (2000); see Table 1, Panel B. Low Cash Status is a dummy variable, equal to 1 if the firm's cash stock at the beginning of the year, divided by mean industry investment, is at or below the 40th percentile in our sample. Mean industry investment is calculated separately for each year and each of 12 Fama-French industry groups. (See Table 1, Panel A.) All standard errors are adjusted for clustering at the firm level. The tobit regressions account for two-sided censoring of the kink variable at 0 and 8.

	(1)	(2)	(3)	(4)
Longholder	1.122	1.256	0.647	0.919
	(1.75)*	(1.94)*	(1.71)*	(2.26)**
CEO Stock Ownership		3.369	-1.145	-1.040
		(1.01)	(0.48)	(0.43)
CEO Vested Options		-3.025	-3.193	-2.976
		(0.70)	(2.02)**	(1.83)*
Low Cash Status				-0.141
				(0.64)
Longholder * (Low Cash Status)				-0.720
				(1.24)
Kink Controls			X	X
Industry Fixed Effects			X	X
Observations	1726	1726	1726	1725
Number of Firms	189	189	189	189

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Distribution of Longholder Net Equity Issues by Kink

The sample is all firm years in which Longholder equals 1. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. Kink (Graham (2000)) is the amount of interest at the point where the marginal benefit function becomes downward sloping, as a proportion of actual interest expense. Net equity issues are sales of common stock minus stock repurchases and are normalized by beginning of the year assets.

	Kink ≤ 1	1 < Kink ≤ 3	3 < Kink ≤ 7	Kink > 7
10th percentile	-0.00834	-0.02923	-0.02668	-0.05162
25th percentile	0.00000	-0.00003	-0.01055	-0.01286
50th percentile	0.00544	0.00180	0.00000	0.00000
75th percentile	0.04148	0.00629	0.00348	0.00794
90th percentile	0.09536	0.01733	0.02928	0.01685
Observations	37	110	111	96
Mean	0.02869	0.00600	0.00497	0.00352
Standard Deviation	0.06086	0.05291	0.08199	0.09174

Table 7. Longholder and Market Leverage

The dependent variable is end of fiscal year market leverage, measured as debt in current liabilities plus long-term debt divided by the sum of debt in current liabilities, long-term debt and market equity. Net Financing Deficit is cash dividends plus net investment plus change in working capital minus cash flow after interest and taxes, normalized by beginning-of-the-year assets. Net investment is capital expenditures plus increase in investments plus acquisitions plus other uses of funds minus sale of PPE minus sale of investment. Change in working capital is change in operating working capital plus change in cash and cash equivalents plus change in current debt. Cash flow after interest and taxes is income before extraordinary items plus depreciation and amortization plus extraordinary items and discontinued operations plus deferred taxes plus equity in net loss (earnings) plus other funds from operations plus gain (loss) from sales of PPE and other investments. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. Profitability is operating income before depreciation normalized by beginning of the year assets; tangibility is property, plants, and equipment, normalized by beginning of the year assets; Q is the market value of assets over the book value of assets, where market value of assets is the book value of total assets plus market equity minus book equity. Profitability, Tangibility, ln(Sales), Q, Net Financing Deficit, and CEO Stock Ownership are measured at the beginning of the fiscal year. CEO Vested Options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a percentage of common shares outstanding and multiplied by 10 (making the mean roughly comparable to CEO Stock Ownership). $Returns_x$ are the natural logarithm of 1 plus stock returns (excluding dividends) from year x-1 to x. All standard errors are adjusted for clustering at the firm level.

	(1) Pooled Baseline	(2) Firm Fixed Effects	(3) Longholder	(4) Return Controls	(5) CEO Controls	(6) Tenure Interaction	(7) Year Fixed Effects
Profitability	-0.7074	-0.46	-0.4634	-0.2774	-0.2733	-0.2755	-0.3586
	(-5.18)***	(-6.79)***	(-6.88)***	(-3.78)***	(-3.73)***	(-3.81)***	(-4.64)***
Tangibility	0.1155	0.0248	0.0238	0.0265	0.0282	0.0289	0.0286
	(2.66)***	(0.58)	(0.56)	(0.63)	(0.67)	(0.70)	(0.70)
ln(Sales)	0.036	0.0476	0.0491	0.0338	0.0342	0.0356	0.0513
	(4.03)***	(4.76)***	(4.92)***	(3.32)***	(3.35)***	(3.44)***	(4.11)***
Q	-0.0424	-0.0126	-0.0119	0.0028	0.0024	0.0031	0.0089
	(-2.68)***	(-1.86)*	(-1.76)*	(0.40)	(0.34)	(0.45)	(1.31)
Net Financing Deficit	0.2438	0.1228	0.1227	0.1189	0.1202	0.1189	0.1238
	(4.14)***	(4.96)***	(4.95)***	(4.75)***	(4.85)***	(4.79)***	(5.20)***
$Returns_{t-1}$				-0.0692	-0.0702	-0.0698	-0.0718
				(-4.21)***	(-4.22)***	(-4.15)***	(-4.05)***
$Returns_{t-2}$				-0.056	-0.0563	-0.0551	-0.0526
				(-2.72)***	(-2.72)***	(-2.66)***	(-2.38)**
$Returns_{t-3}$				-0.0416	-0.0418	-0.0404	-0.0469
				(-3.54)***	(-3.53)***	(-3.44)***	(-3.88)***
$Returns_{t-4}$				-0.0307	-0.0312	-0.0299	-0.0396
				(-3.48)***	(-3.51)***	(-3.37)***	(-4.21)***
$Returns_{t-5}$				-0.0105	-0.0102	-0.0093	-0.0176
				(-1.30)	(-1.23)	(-1.12)	(-2.11)**
CEO Stock Ownership					0.1097	0.1152	0.1085
					(1.74)*	(1.64)	(1.60)
CEO Vested Options					0.1073	0.1008	0.1119
					(2.54)**	(2.44)**	(2.48)**
Tenure						-0.0009	-0.0007
						(-1.06)	(-0.81)
Longholder			0.0361	0.041	0.0407	0.0637	0.0517
			(1.98)**	(2.44)**	(2.40)**	(2.78)***	(2.28)**
(Longholder)*(Tenure)						-0.0019	-0.0021
						(-1.36)	(-1.45)
Firm Effects		X	X	X	X	X	X
Year Effects							X
Observations	2,184	2,184	2,184	2,184	2,184	2,184	2,184
Number of Firms		241	241	241	241	241	241
Adjusted R-squared (Within)		0.11	0.12	0.16	0.17	0.17	0.22
Adjusted R-squared	0.35	0.7719	0.7727	0.7845	0.7855	0.7863	0.7996

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8. Correlations of Army and Depression Baby with Firm and CEO Characteristics

Army is an indicator variable for CEOs with prior military service. Depression Baby indicates CEOs born between 1920 and 1929. Return on Assets is income before extraordinary items plus interest expense plus depreciation, divided by assets. Market Leverage is debt in current liabilities plus long-term debt, divided by the sum of debt in current liabilities, long-term debt and market equity. Kink is the amount of interest at which the marginal benefit function starts to slope down, as a proportion of actual interest expense. At Least 1 Equity Issuance indicates a stock issue, conditional on accessing public securities markets. PRESS "Reliable" is the number of articles from LexisNexis and Wall Street Journal searches which describe the CEO as "reliable, cautious, practical, conservative, steady, frugal." TOTALmentions is the total number of articles mentioning the CEO in both sets of searches. Standard errors in Panel B are adjusted for clustering at the CEO level.

Panel A. Pairwise Correlations

	Army	Depression Baby	Age	Tenure	Return on Assets	Stock Ownership	Market Leverage	At Least 1 Merger	Kink	At Least 1 Equity Issuance	PRESS "Reliable"
Army	1										
	(- ; 2378)										
Depression Baby	0.1472	1									
	(0.00; 2320)	(- ; 3617)									
Age	0.1332	0.3766	1								
	(0.00; 2320)	(0.00; 3617)	(- ; 3617)								
Tenure	-0.056	0.1009	0.3668	1							
	(0.01; 2250)	(0.00; 3500)	(0.00; 3500)	(- ; 3501)							
Return on Assets	-0.0808	0.0680	0.0012	0.0289	1						
	(0.00; 2267)	(0.00; 3454)	(0.95; 3454)	(0.09; 3362)	(- ; 4393)						
Stock Ownership	-0.0941	-0.1061	-0.0332	0.3084	0.0164	1					
	(0.00; 2258)	(0.00; 3496)	(0.05; 3496)	(0.00; 3454)	(0.34; 3360)	(- ; 3497)					
Market Leverage	0.0227	-0.0586	-0.0337	-0.0911	-0.3792	-0.0579	1				
	(0.28; 2263)	(0.00; 3504)	(0.05; 3504)	(0.00; 3425)	(0.00; 4281)	(0.00; 3425)	(- ; 4528)				
At Least 1 Merger	0.0674	0.0085	-0.0278	-0.0300	-0.0513	-0.0105	0.0045	1			
	(0.00; 2378)	(0.61; 3617)	(0.09; 3617)	(0.08; 3501)	(0.00; 4393)	(0.53: 3497)	(0.76; 4528)	(- ; 5131)			
Kink	-0.022	0.1129	0.0305	0.0598	0.4318	0.0977	-0.6468	-0.0300	1		
	(0.34; 1868)	(0.00; 2846)	(0.10: 2846)	(0.00; 2764)	(0.00; 2912)	(0.00; 2770)	(0.00; 2900)	(0.10; 2978)	(- ; 2978)		
At Least 1 Equity Issuance	0.1105	-0.0829	-0.1534	-0.0314	-0.0477	0.0458	-0.0955	0.0392	-0.0953	1	
	(0.01; 524)	(0.02; 739)	(0.00; 739)	(0.40; 727)	(0.19; 748)	(0.22; 718)	(0.01; 752)	(0.28; 769)	(0.01; 654)	(- ; 769)	
PRESS "Reliable"	-0.08	0.036	0.0194	0.154	-0.0162	0.1003	-0.0272	-0.0199	-0.0347	-0.0098	1
	(0.00; 2378)	(0.03; 3580)	(0.25; 3580)	(0.00; 3471)	(0.33; 3560)	(0.00; 3465)	(0.10; 3558)	(0.22; 3803)	(0.06; 2917)	(0.79; 756)	(- ; 3803)

p-values and number of observations in parentheses.

Panel B. Regression on Press Variables

	Army	Depression Baby
Age	0.0093	0.0269
	(3.24)***	(8.16)***
PRESS "Reliable"	-0.0208	0.0102
	(-1.66)*	(0.62)
PRESS Total Articles	-0.0007	0.0001
	(-1.68)*	(0.20)
Observations	2320	3030
R-squared	0.03	0.16

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9. Depression Baby and Financing Choices

Depression Baby indicates CEOs born between 1920 and 1929. Kink is the amount of interest at which the marginal benefit function starts to slope down, as a proportion of actual interest expense. Kink Controls are defined as in Graham (2002) and include dummies for No Dividend, Negative Owners' Equity, and NOL Carryforward, where NOL means net operating loss; ECOST (the product of (1) the standard deviation of the first difference in taxable earnings divided by assets and (2) the sum of advertising, research, and development expenses divided by sales); CYCLICAL (the standard deviation of operating earnings divided by mean assets first calculated for each firm, then averaged for each two-digit SIC code); Return on Assets (income before extraordinary items plus interest expense plus depreciation, divided by assets); Z-Score (3.3 times the difference of operating income before depreciation and depreciation plus sales plus 1.4 times retained earnings plus 1.2 times working capital [balance sheet], divided by assets); Quick Ratio (sum of cash and short-term investments and total receivables divided by total current liabilities); Current Ratio (total current assets, divided by total current liabilities); Q-Ratio (preferred stock plus market value of common equity plus net short-term liabilities, divided by assets); R&D-to-Sales and Advertising-to-Sales. The final two variables are set to 0 when the numerator is missing. Industry Fixed Effects are the kink-regression industry dummies of Graham (2000); see Table 1, Panel B. Standard errors in Panel A are adjusted for clustering at the firm level. Net equity issues are sales of common stock minus stock repurchases and are normalized by beginning of the year assets.

Panel A. Kink Regressions

	(1) Tobit	(2) Tobit
Depression Baby	0.8984	0.5053
	(2.27)**	(2.07)**
Age		-0.0260
		(-1.38)
Tenure		-0.0159
		(-0.88)
Kink Controls		X
Industry Fixed Effects		X
Observations	1,717	1,717

* significant at 10%; ** significant at 5%; *** significant at 1%

Panel B. Distribution of "Depression Baby" Net Equity Issues by Kink

	Kink ≤ 1	1 < Kink ≤ 3	3 < Kink ≤ 7	Kink > 7
10th percentile	-0.00846	-0.03568	-0.04293	-0.06254
25th percentile	0	-0.00855	-0.01158	-0.02315
50th percentile	0.00104	0.00047	0.00001	0
75th percentile	0.00800	0.00570	0.00575	0.00523
90th percentile	0.05131	0.04080	0.01893	0.01646
Observations	74	270	240	175
Mean	0.00950	0.00277	-0.00088	-0.01053
Standard Deviation	0.03470	0.05085	0.07096	0.06885

Table 10. Military Service and Market Leverage

The dependent variable is end of fiscal year market leverage, measured as debt in current liabilities plus long-term debt divided by the sum of debt in current liabilities, long-term debt and market equity. Profitability is operating income before depreciation normalized by beginning of the year assets. Tangibility is property, plants, and equipment, normalized by beginning of the year assets. Q is the market value of assets over the book value of assets, where market value of assets is the book value of total assets plus market equity minus book equity. Net Financing Deficit is cash dividends plus net investment plus change in working capital minus cash flow after interest and taxes, normalized by beginning-of-the-year assets. Net investment is capital expenditures plus increase in investments plus acquisitions plus other uses of funds minus sale of PPE minus sale of investment. Change in working capital is change in operating working capital plus change in cash and cash equivalents plus change in current debt. Cash flow after interest and taxes is income before extraordinary items plus depreciation and amortization plus extraordinary items and discontinued operations plus deferred taxes plus equity in net loss (earnings) plus other funds from operations plus gain (loss) from sales of PPE and other investments. Profitability, Tangibility, ln(Sales), Q, Net Financing Deficit, and Stock Ownership are measured at the beginning of the fiscal year. Army is an indicator variable for CEOs with prior military service; World War II Veteran indicates service during World War II. Depression Baby indicates CEOs born between 1920 and 1929. CEO Vested Options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a percentage of common shares outstanding and multiplied by 10 (so that the mean is roughly comparable to CEO Stock Ownership). Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. All standard errors are adjusted for clustering at the firm level.

	(1)	(2)	(3)	(4)	(5)
	Military Service	Controls	Tenure Interaction	WWII Veterans	Military, Longholder, Depression
Profitability		-0.3364	-0.3389	-0.3281	-0.4866
		(-3.52)***	(-3.54)***	(-3.56)***	(-5.79)***
Tangibility		-0.0062	-0.0071	-0.0035	0.0264
		(-0.16)	(-0.19)	(-0.09)	(0.73)
ln(Sales)		0.0418	0.0448	0.0411	0.0507
		(3.07)***	(3.27)***	(3.09)***	(3.45)***
Q		-0.013	-0.0134	-0.0132	-0.011
		(-1.92)*	(-1.97)*	(-1.94)*	(-1.56)
Net Financing Deficit		0.1427	0.1435	0.1406	0.1294
		(4.48)***	(4.46)***	(4.49)***	(4.66)***
Age		0.0036	0.0036	0.0025	0.0032
		(2.90)***	(3.01)***	(2.08)**	(2.24)**
Tenure		-0.0054	-0.0063	-0.0051	-0.0056
		(-4.60)***	(-5.43)***	(-4.75)***	(-4.73)***
Army	0.0353	0.0326	-0.0035	-0.0015	0.0299
	(1.69)*	(1.92)*	(-0.18)	(-0.08)	(1.89)*
(Army)*(Tenure)			0.0052		
			(2.73)***		
World War II Veteran				0.0695	
				(2.21)**	
Depression Baby					0.0048
					(0.24)
CEO Stock Ownership					0.0291
					(0.73)
CEO Vested Options					-0.0261
					(-1.60)
Longholder					0.0535
					(1.71)*
Year Effects	X	X	X	X	X
Firm Effects	X	X	X	X	X
Observations	1,626	1,626	1,626	1,626	1,614
Number of Firms	210	210	210	210	208
Adjusted R-squared (within)	0.08	0.19	0.19	0.19	0.21

* significant at 10%; ** significant at 5%; *** significant at 1%