

# Who Makes Acquisitions?

## CEO Overconfidence and the Market's Reaction\*

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### Abstract

Does CEO overconfidence help to explain merger decisions? Overconfident CEOs overestimate their ability to generate returns. Using a simple model, we show that overconfident CEOs overpay for target companies and undertake value-destroying mergers. The effect is strongest if they have access to internal financing. We test these predictions with two overconfidence proxies: CEOs' personal over-investment in their company and their press portrayal. The odds of overconfident CEOs making an acquisition are 65% higher. The effect is largest if the merger does not require external financing. The market reaction at merger announcement (-100 basis points) is significantly more negative than for non-overconfident CEOs. We consider alternative interpretations including inside information, signaling, and risk tolerance. (JEL G34, G14, G32, D80)

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*“Many managements apparently were overexposed in impressionable childhood years to the story in which the imprisoned handsome prince is released from a toad’s body by a kiss from a beautiful princess. Consequently, they are certain their managerial kiss will do wonders for the profitability of Company T[arget]... We’ve observed many kisses but very few miracles. Nevertheless, many managerial princesses remain serenely confident about the future potency of their kisses—even after their corporate backyards are knee-deep in unresponsive toads.”*

-Warren Buffet, Berkshire Hathaway Inc. Annual Report, 1981<sup>1</sup>

U.S. firms spent more than \$3.4 trillion on over 12,000 mergers during the last two decades. If chief executive officers (CEOs) act in the interest of their shareholders, these mergers should have increased their shareholders’ wealth. Yet, acquiring shareholders lost over \$220 billion at the announcement of merger bids from 1980 to 2001 (Moeller, Schlingemann, and Stulz, 2005). While the estimates of the overall value created by mergers vary across studies, acquiring shareholders often appear to be on the losing end.<sup>2</sup>

In this paper, we ask whether CEO overconfidence helps to explain this evidence. Managerial biases like overconfidence are gaining increasing attention in the corporate finance literature (Barberis and Thaler, 2003; Baker, Ruback, and Wurgler, forthcoming). Imperfect governance mechanisms make it difficult for investors to correct inefficient managerial choices. Overconfidence, in particular, has long had popular appeal as an explanation for failed mergers.<sup>3</sup> Roll (1986) first formalized the notion, linking takeover contests to the winner’s curse.

We present a simple model showing that overconfident CEOs may indeed pursue value-destroying mergers and overpay for targets. The implications of overconfidence are, however, more subtle than mere overbidding. Overconfident CEOs also overestimate the returns they

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<sup>1</sup>Quote taken from Weston et al. (1998).

<sup>2</sup>Andrade et al. (2001) find average stock price reactions of -0.4 percent and -1.0 percent for acquirors during the 1980s and 1990s (over a three-day window surrounding the mergers). See also Dodd (1980), Firth (1980), and Ruback and Mikkelsen (1984) for acquiror losses. See, e.g. Asquith (1983), Bradley et al. (1983), and Andrade et al. (2001) for target gains. Whether the net effect is significantly positive varies with the data (SDC, CRSP), the time period, and the event study methodology. See Jensen and Ruback (1983) and Roll (1986) for surveys of earlier studies.

<sup>3</sup>Some recent business press articles are *US Newslink* December 13, 2001 (“Enron’s Bust: Was it the result of Over-Confidence or a Confidence Game?”); *CFO Magazine* June 1, 2004 (“Avoiding decision traps”); *Accenture Outlook Journal* January 2000 (“Mergers & Acquisitions: Irreconcilable Difference”).

can generate in their own company and thus believe outside investors undervalue their securities. As a result, they are reluctant to raise external finance and may forego mergers that require external financing. Overall, then, the effect of overconfidence on merger frequency is ambiguous. Overconfident managers are unambiguously more likely to conduct mergers only if they have sufficient internal resources. Overpayment and the lower average quality of mergers by overconfident CEOs should be reflected in a (more) negative market reaction to their bids.

We test whether CEOs display the behavior predicted by our model using a sample of 394 large U.S. firms from 1980 to 1994. We use data on CEOs' decisions to exercise executive stock options to elicit their beliefs about their companies' future performance. Previous literature shows that risk averse CEOs should exercise in-the-money options before expiration to reduce their exposure to company-specific risk.<sup>4</sup> A subset of CEOs in our data persistently fail to do so. They delay option exercise all the way until expiration, even when the underlying stock price exceeds "rational benchmarks" from Hall and Murphy (2002). Moreover, they typically make losses from holding on to their options relative to a diversification strategy.

We consider a number of explanations for these portfolio decisions: inside information, signaling, board pressure, risk tolerance, taxes, procrastination, and overconfidence. Positive CEO beliefs (based on information on overconfidence) and risk-seeking preferences emerge as the most straightforward ways to link CEO private investment and corporate merger decisions. CEOs who do not exercise vested in-the-money stock options for at least five years reveal persistently optimistic beliefs about the returns they will generate in their company. These CEOs may be personally profiting from or (rationally) signaling positive inside information, or they may be overconfident. Inside information and signaling, however, are hard to reconcile with the losses CEOs incur by not diversifying their personal portfolios and the (more) negative market reaction to their merger bids. Risk seeking preferences are difficult to reconcile with the observed preference for cash financing and diversifying mergers.

Next, we link "revealed beliefs" from CEOs' personal portfolio choices to their merger decisions. We identify CEOs who fail to diversify their personal portfolio both in a fixed-effects framework ("Longholder") and allowing for variation over time ("Post-Longholder" and "Holder 67"). We find that CEOs who hold on to options are significantly more likely to conduct mergers at any point in time. The difference is most pronounced for diversifying

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<sup>4</sup>See e.g. Lambert et al. (1991).

acquisitions, which are likely candidates for value destruction.<sup>5</sup> Consistent with the predictions of the overconfidence model, these effects are largest if the CEO does not need to access external markets for financing. Moreover, we find that Longholder and Holder 67 CEOs display some preference for cash- or debt-financed mergers. The results hold controlling for standard determinants of mergers like  $Q$ , size and cash flow. We also use firm fixed effects to remove the impact of time-invariant firm characteristics, like corporate governance.<sup>6</sup> Our findings suggest that CEOs with overly positive expectations about their ability to generate stock returns undertake low-quality mergers.

We perform a variety of robustness checks. We control for merger waves by including the interaction of industry and year fixed effects and for firm-specific bubbles by including five lags of company stock returns. We also control for other factors which may be related both to merger frequency and late option exercise: volatility, dividend policy, and CEO characteristics (educational background, age, tenure). In all cases, the results are unaffected.

To test further the overconfidence interpretation, we hand-collect data on CEO press coverage in leading business publications. We identify CEOs characterized as “confident” or “optimistic” versus “reliable,” “cautious,” “conservative,” “practical,” “frugal,” or “steady.” Characterization as confident or optimistic is significantly positively correlated with our portfolio measures of optimistic beliefs. Moreover, we replicate all results of our prior analyses, using press characterization as an alternative measure of overconfidence. Since press coverage may be endogenous to mergers, we conduct the latter analysis in a duration model restricted to CEO-firm years up to the first merger (if any).

Finally, we evaluate mergers using announcements effects. We show that investors react significantly more negatively to merger bids of CEOs we classify as overconfident. Over the three-day window around announcements, they lose on average 100 basis points, compared to 27 basis points for non-overconfident CEOs. This result holds controlling for relatedness of the target and acquirer, ownership stake of the acquiring CEO, corporate governance of the acquirer, and method of financing. While it is hard to infer the overall value implications of mergers from announcement effects (Shleifer and Vishny, 2003; Mitchell, Pulvino, and Stafford,

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<sup>5</sup>Lang and Stulz (1994), Berger and Ofek (1995), Servaes (1991), and Lamont and Polk (2002), e.g., show that diversified firms trade at a discount relative to stand-alones in the same industry. Graham, Lemmon, and Wolf (2002) and Villalonga (2004), among others, question this interpretation due to pre-existing discounts or econometric and data biases. Using detailed plant-level data, Schoar (2002) confirms the negative impact of diversification via acquisition.

<sup>6</sup>We also control for board size and concentration of power (CEO is also chairman and president) directly.

2004), the differential reaction to bids of overconfident CEOs is likely to be orthogonal to market frictions and inefficiencies and, thus, to capture value differences.

Our results suggest that a significant subset of CEOs is overconfident about their future cash flows and engage in mergers that do not warrant the paid premium. Overconfident CEOs may create firm value along some dimensions<sup>7</sup> – but mergers are not among them.

Our paper is related to several strands of literature. First, we contribute to research on the explanations of mergers. Much of the literature focuses on the efficiency gains of mergers (e.g. Lang, Stulz, and Walkling, 1989; Servaes, 1991; Mulherin and Poulsen, 1998). Overconfidence, instead, is closest to empire-building theories (Jensen, 1986 and 1988). Both theories predict heightened acquisitiveness to the detriment of shareholders, especially given abundant internal resources. Unlike traditional empire-builders, however, overconfident CEOs believe that they are acting in the interest of shareholders, and are willing to invest in their company. Thus, overconfidence challenges the effectiveness of stock and options as an incentive mechanism.

The paper also contributes to the literature on overconfidence. Psychologists suggest that individuals are especially overconfident about outcomes they believe are under their control (Langer, 1975; March and Shapira, 1987) and to which they are highly committed (Weinstein, 1980; Weinstein and Klein, 2002).<sup>8</sup> Both criteria apply to mergers. The CEO gains control of the target. And a successful merger enhances professional standing and personal wealth.

We also contribute to the growing strand of behavioral corporate finance literature considering the consequences of biased managers in efficient markets (Barberis and Thaler, 2003; Baker, Ruback, and Wurgler, forthcoming; Camerer and Malmendier, forthcoming). A number of recent papers study upward biases in managers' self-assessment, focusing on theory (Heaton, 2002), decisions taken by entrepreneurs (Landier and Thesmar, 2004), or indirect measures of "hubris" (Hayward and Hambrick, 1997). We complement the existing literature by using CEO decisions to directly measure biased managerial beliefs in large U.S. companies. Our paper makes several important improvements over previous attempts to measure CEO

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<sup>7</sup>Schelling (1960), Goel and Thakor (2000), Bernardo and Welch (2001), and Van den Steen (2005) explore positive effects of overconfidence.

<sup>8</sup>Note that this literature describes the overestimation of future outcomes, not the underestimation of confidence intervals. Upward bias in the assessment of future outcomes is sometimes referred to as "overoptimism" rather than "overconfidence." We follow the literature on self-serving attribution and choose the label "overconfidence" in order to distinguish the overestimation of one's own abilities (such as IQ or managerial skills) and outcomes relating to one's own personal situation from the general overestimation of exogenous outcomes (such as the growth of the U.S. economy).

overconfidence, especially compared to Malmendier and Tate (2005). In the latter paper, we analyze investment-cash flow sensitivity using an overconfidence measure similar to “Longholder.” A key improvement in this paper is that we allow CEO overconfidence to vary over time, rather than focusing exclusively on managerial fixed effects. This approach removes the forward-looking information inherent in fixed effects. Second, we construct an alternative measure of overconfidence, based on media perception rather than portfolio decisions, and show that it predicts similar merger behavior. The media-based results are difficult to reconcile with several alternative interpretations of the option-based measures, including board pressure or taxes. Third, we directly assess market beliefs about CEOs’ decisions using announcement effects. In Malmendier and Tate (2005), the annual capital expenditure data did not allow us to estimate the market response to investment decisions.

The paper is organized as follows. In Section I, we present a simple model of managerial overconfidence. Section II introduces the data. Section III presents our empirical measures of delayed option exercise and discusses alternative interpretations. In Section IV, we describe the empirical strategy and provide evidence that overconfidence affects managerial acquisitiveness. We show similar results for the press-based measure of overconfidence in Section V. In Section VI, we study the market reaction to mergers by overconfident CEOs. Section VII concludes.

## I Model

We construct a simple model that demonstrates the effect of overconfidence on mergers. To isolate the role of overconfidence, we assume a frictionless market with symmetric information between managers and outside investors and aligned incentives between managers and current shareholders. The model shows that the effect of overconfidence on merger frequency is ambiguous, but that overconfidence has robust implications for merger quality and financing. We consider first a single firm bidding for a target and assume that the acquiror extracts the full surplus. We then show how variations in the bargaining power of the target and acquiror, for example due to competition among bidders, affect the payment to target shareholders.

### A Single Acquiror with Full Bargaining Power

Denote the market value of Acquiror  $A$  and Target  $T$  as  $V_A$  and  $V_T$  respectively. The CEO of  $A$  chooses whether or not to acquire  $T$ . He has access to an amount  $\bar{c}$  of internal resources

(cash and riskless debt). We denote the amount paid to the target shareholders as part of the merger financing as  $c$ , with  $c \leq \bar{c}$ .  $V(c)$  is the market value of the combination of  $A$  and  $T$  after paying out  $c$ ,  $\widehat{V}(c)$  the  $A$  manager's valuation of the combination of  $A$  and  $T$ , and  $\widehat{V}_A$  his perception of his own company's value if he does not pursue the merger. An overconfident CEO overestimates the returns he will generate, whether in his current company or in a merged company. He may also overestimate the synergies between his company and a potential target, or underestimate how disruptive a merger will be. He thus overvalues his own company,  $\widehat{V}_A > V_A$ , as well as the merger,  $\widehat{V}(c) - V(c) > \widehat{V}_A - V_A$  for some  $c$ .

Since the acquiror has all the bargaining power, the manager of  $A$  pays  $V_T$  for the target, independent of his degree of overconfidence. If the  $A$  manager offers an amount  $c < V_T$  of cash financing (or other non-diluting assets), target shareholders demand a share  $s$  of the merged company such that  $sV(c) = V_T - c$ .

A rational CEO chooses to conduct the takeover if and only if  $V(c) - (V_T - c) > V_A$ . Denoting the merger synergies as  $e \in R$ , we can decompose  $V(c)$  into

$$V(c) = V_A + V_T + e - c. \quad (1)$$

Not surprisingly, the rational CEO makes the first best acquisition decision and decides to acquire whenever  $e > 0$ . His decision is independent of  $c$ . Since the capital market is fully efficient, there is no extra cost of raising external capital to finance the merger and the CEO is indifferent among cash, equity, or a combination.

An overconfident CEO overestimates the returns to merging, but also believes that (partial) equity financing entails a loss to current shareholders of  $(\frac{V_T - c}{V(c)} - \frac{V_T - c}{\widehat{V}(c)})\widehat{V}(c)$ .<sup>9</sup> He undertakes the merger if and only if he perceives current shareholders' ownership share in the merged company to be worth more than the original company, i.e. iff  $(1 - s)\widehat{V}(c) > \widehat{V}_A$  for some  $c \leq \bar{c}$ . Substituting for  $s$ , he acquires  $T$  iff  $\widehat{V}(c) - (V_T - c) - \frac{[\widehat{V}(c) - V(c)](V_T - c)}{V(c)} > \widehat{V}_A$  for some  $c$ . Denoting the "perceived" additional merger synergies as  $\widehat{e} \in R_{++}$ ,<sup>10</sup> we can decompose  $\widehat{V}(c)$ :

$$\widehat{V}(c) = \widehat{V}_A + V_T + e + \widehat{e} - c. \quad (2)$$

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<sup>9</sup>Risky debt has similar properties: managers view the demanded interest rate as too high.

<sup>10</sup>More generally, the perceived synergies  $\widehat{e}$  might depend on the outflow of cash  $c$ . In particular, allowing  $\widehat{e}$  to decrease with  $c$  is a way to capture the dynamic effects of cash constraints (perceived undervaluation) on an overconfident CEO's future merger and investment decisions. For  $\widehat{e}(\cdot) > 0$ , the results of this section hold.

Then, using (1) and (2), the overconfident manager's decision rule is to merge whenever  $e + \hat{e} > \frac{(\hat{V}_A - V_A + \hat{e})(V_T - c)}{V(c)}$ . That is, he merges whenever actual and perceived merger synergies exceed the perceived loss due to dilution. Combining the results for the rational and overconfident cases yields the following lemma and propositions.

**Lemma 1** *An overconfident CEO exhausts his supply of internal (non-diluting) assets before issuing equity to finance a merger.*

*Proof.* An overconfident CEO perceives the post-acquisition value to current shareholders as  $G = (1 - s)\hat{V}(c) = \frac{V(c) - V_T + c}{V(c)}\hat{V}(c) = \frac{(V_A + e)(\hat{V}_A + V_T + e + \hat{e} - c)}{V_A + V_T + e - c}$ , where the last equality uses (1) and (2). Then  $\frac{\partial G}{\partial c} = \frac{(V_A + e)(\hat{V}_A - V_A + \hat{e})}{(V(c))^2} > 0$  (as  $\hat{V}_A > V_A$  and  $\hat{e} > 0$  by assumption). Post-merger value is maximized on  $c \in [0, V_T]$  by setting  $c$  as high as possible. Q.E.D.

**Proposition 1** *A rational CEO never conducts a value-destroying merger. An overconfident CEO does a value-destroying merger if perceived synergies  $\hat{e}$  are sufficiently large relative to perceived undervaluation  $(\hat{V}_A - V_A)$  and the portion of the deal financed by equity  $\frac{V_T - c}{V}$ .*

*Proof.* The first-best decision rule of a rational CEO immediately implies that he does not conduct a value-destroying merger. An overconfident CEO conducts a merger whenever  $e + \hat{e} > \frac{(\hat{V}_A - V_A + \hat{e})(V_T - c)}{V(c)}$ . Thus, if  $e \leq 0$ , he still conducts the merger as long as  $\hat{e} > |e|$  and  $\hat{V}_A - V_A$  and  $\frac{V_T - c}{V(c)}$  are sufficiently small. Q.E.D.

**Proposition 2** *(i) If  $\bar{c} \geq V_T$ , an overconfident CEO conducts any merger a rational CEO would conduct and some mergers a rational CEO would not. (ii) If  $\bar{c} < V_T$ , an overconfident CEO does some (value-destroying) mergers a rational CEO would not and a rational CEO does some (value-creating) mergers that an overconfident CEO would not.*

*Proof.* If  $\bar{c} \geq V_T$ , the overconfident manager sets  $c = V_T$  by Lemma 1. The resulting condition to do the merger is  $e + \hat{e} > 0$ . Since the rational CEO merges whenever  $e > 0$ , the first part of Proposition 2 follows from  $\hat{e} > 0$ . For  $\bar{c} < V_T$ , the first statement follows from Proposition 1. To show the second statement in (ii), suppose  $e > 0$ . Then, the rational CEO always does the merger. The overconfident CEO will not do the merger if and only if  $e + \hat{e} < \frac{(\hat{V}_A - V_A + \hat{e})(V_T - c)}{V(c)}$ , i.e. if  $\hat{e}$  is sufficiently small and  $\hat{V}_A - V_A$  or  $\frac{V_T - c}{V(c)}$  are sufficiently large. Q.E.D.

## B Competing Acquirors

We now extend the setup to show how competition among bidders can induce overpayment. We consider  $I$  potential acquirors  $A_i$ ,  $i = 1, \dots, I$ . Denote by  $W_i$  the  $A_i$  manager's maximal



willingness to pay for  $T$ .  $W_i$  is simply the market value of the target plus the (perceived) surplus to  $A_i$ 's current shareholders as a result of the merger, i.e.

1.  $W_i = V_T + e_i$  if the  $A_i$  manager is rational;
2.  $W_i = V_T + e_i + \hat{e}_i - 1_{\{\bar{c}_i < W_i\}} \frac{(\hat{V}_{A_i} - V_{A_i} + \hat{e}_i)(W_i - \bar{c}_i)}{V_{A_i} + V_T + e_i - \bar{c}_i}$  if the  $A_i$  manager is overconfident.

In an English auction with  $\max W_i \geq V_T$  the equilibrium outcome is as follows<sup>11</sup>:

1. The winning bidder is  $A_{i^*}$ , where  $i^* = \arg \max_i W_i$ .
2. The winning bid is  $b^* = \max\{(\max_{i \neq i^*} W_i), V_T\}$ .

Defining ‘overpayment’ as a transfer from the winner  $A_{i^*}$  to  $T$  that is higher than the sum of target value and synergies,  $V_T + e_{i^*}$ , we have the following proposition.

**Proposition 3** *If the manager of the winning acquiror  $A_{i^*}$  is overconfident, he will over-pay if  $\max_{i \neq i^*} W_i \in (V_T + e_{i^*}, W_{i^*})$ .*

Competition and heterogeneity in synergies may thus induce overconfident CEOs to over-pay. Note, however, that contrary to Roll’s theory, an overconfident bidder does not always bid higher than a rational bidder. An overconfident bidder who is considerably more overconfident about the value of his own company than about the merger may lose the takeover contest.

The extended framework also allows us to capture the implications of relative bargaining strength more generally. Competition among potential acquirors in a bidding framework is a simple way to endogenize variations in the amount of surplus  $A$  can extract, without assumptions about relative bargaining power and about higher-order beliefs about the parties’ perception of surplus and the interaction of these beliefs with relative bargaining strength.

## C Further Extensions

**External versus internal investment.** We have modeled overconfident CEOs as overestimating both the stand-alone value of their company and synergies with other (target) companies. Overconfidence about the own company may reflect overvaluation of internal investment projects and could counteract acquisitiveness if resources are scarce. An extended model of corporate decision-making includes the portfolios of both potential acquisitions and internal projects. When new resources become available, the CEO initiates the next project on either

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<sup>11</sup>We ignore the knife-edge case of a tie.

or both menus. Relative returns determine which project is chosen first. Over time, however, overconfidence is revealed in the number and quality of projects of both types.<sup>12</sup>

**Merger waves.** The traditional winner’s curse formulation of overconfidence does not easily capture the empirical phenomenon of merger waves. To serve as an explanation, the level of CEO overconfidence or the prevalence of overconfident CEOs in the population would need to vary. Analyzing overconfidence in the context of market interaction remedies this puzzle. Overconfidence implies overestimation of merger synergies and reluctance to raise external finance. From a theoretical perspective, the net effect of overconfidence on merger frequency is ambiguous. In a dynamic set-up this ambiguity can serve as a foundation for merger waves. As inflows of cash or capital market conditions mitigate perceived financing constraints, the overestimation of synergies dominates and overconfidence leads to increased merger frequency.

**Overconfidence of target CEOs.** We have focused on overconfidence in acquiring managers. Indeed, overconfidence may be a feature distinguishing acquirors from targets. Allowing target managers to also be overconfident does not change the model’s qualitative predictions, but yields many interesting comparative statistics. For example, acquisitions of target firms with overconfident management are more likely to be hostile. The overconfident target management might believe they can create at least as much value as the potential acquirors and, hence, reject shareholder-value increasing bids as too low. Similarly, acquirors may have to pay higher premia for targets with overconfident managers, even in friendly deals. In both cases, overconfidence on the side of the target management can be beneficial to the target shareholders. Unfortunately, we cannot test any of these implications due to data limitations.<sup>13</sup>

## D Empirical Predictions

In the remainder of the paper, we test the empirical implications of our model. To facilitate the translation of the model into predictions about a cross-section of CEOs, we suppose that  $e$  is drawn independently from the same distribution for all potential mergers. That is, overconfident and rational CEOs do not have systematically different merger opportunities.

The first quantity of interest is merger frequency. The net effect of overconfidence on merger

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<sup>12</sup>Another potential use of internal resources is to repurchase shares the overconfident CEO perceives to be undervalued. However, a CEO who maximizes current shareholder value will not undertake such a transaction since any gain to remaining shareholders is offset by a loss to the former shareholder.

<sup>13</sup>Few of our 477 sample firms are targets; even fewer are acquired by another sample firm.

frequency is ambiguous. It is, however, a key indicator of the importance of overconfidence as a general explanation of observed merger activity.

The model also delivers three testable predictions. Proposition 1 and Proposition 2 imply:

**Prediction 1.** Overconfident CEOs are more likely to conduct mergers with a high probability of failure and negative expected returns.

**Prediction 2.** Among CEOs with abundant internal resources (e.g. large cash reserves and low leverage), overconfident CEOs are more likely to conduct acquisitions.

In addition to performing worse mergers, overconfident managers are prone to overpay for their acquisitions (Proposition 3). Under the maintained assumption that the market is strong form efficient, all information about the quality and terms of the deal will be incorporated at the announcement date and we have the following prediction.

**Prediction 3.** The expected returns to merger announcements are lower for overconfident than for non-overconfident CEOs.

Note that the assumption of symmetric information implies that the merger announcement does not convey any information about the fundamentals of the acquiring company. In practice, information revelation will have an impact on the announcement effect (e.g. in Hietala et al. (2003)). For simplicity, we assume that the average effect of such information revelation is the same between overconfident and rational CEOs.

## II Data

Our starting sample consists of 477 large publicly-traded US firms from 1980 to 1994. The core of the data set is described in detail in Hall and Liebman (1998) and Yermack (1995). To be included in the sample, a firm must appear at least four times on one of the Forbes magazine lists of largest US companies from 1984 to 1994.<sup>14</sup> The virtue of this data is its detailed information on CEOs stock and option holdings. We observe, in each sample year, the number of remaining options from the grants the CEO received in each of his prior years in office as well as the remaining duration and strike price. The data provides a fairly detailed picture of the CEO's portfolio rebalancing over his tenure.

We also collect data on articles about the CEOs in *The New York Times*, *Business Week*,

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<sup>14</sup>This criterion essentially excludes IPOs from our sample. Thus, the more stringent restrictions on insider trading associated with such firms, such as lockup periods, do not apply.

*Financial Times*, and *The Economist* using LexisNexis and in the *The Wall Street Journal* using Factiva.com. For each CEO and sample year, we record (1) the total number of articles; (2) the number of articles containing the words “confident” or “confidence;” (3) the number of articles using “optimistic” or “optimism;” (4) the number of articles using “reliable,” “cautious,” “conservative,” “practical,” “frugal,” or “steady.” We hand-check that the terms are used to describe the CEO and separate out articles using “not confident” or “not optimistic.”

We use the SDC and CRSP merger databases to obtain announcement date and merger financing information. The CRSP data set covers only mergers with CRSP-listed targets. We use SDC to supplement the data with acquisitions of private firms, large subsidiaries, and foreign companies.<sup>15</sup> We require that the acquiring company obtains at least 51 percent of the shares of the target (and, hence, control) in the transaction. We omit acquisitions of companies where the acquiror already holds at least 51 percent of the shares. Finally, following Morck et al., (1990), we omit mergers in which the value of the target is less than five percent of the value of the acquiror.<sup>16</sup> For most of the paper, we consider only completed merger bids; however, when we consider market reaction, we include all merger bids in the estimations.

We supplement the data with various items from the COMPUSTAT database. We measure firm size as the natural logarithm of assets (item 6) at the beginning of the year, investment as capital expenditures (item 128), cash flow as earnings before extraordinary items (item 18) plus depreciation (item 14), and capital as property, plants and equipment (item 8). We normalize cash flow with beginning of the year capital. Given that our sample is not limited to manufacturing firms (though it mainly consists of large, nonfinancial firms), we check the robustness of our results to normalization by assets (item 6). We measure Q as the ratio of market value of assets to book value of assets. Market value of assets is defined as 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

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<sup>15</sup>All of our results, however, are robust to using only the CRSP merger database, i.e. mergers involving publicly traded U.S. targets.

<sup>16</sup>This selection criterion is especially important in our context since we merge data from the SDC database with the CRSP merger data. Acquisitions of small units of another company differ substantially from the acquisition of large NYSE firms and may not require the direct involvement of the acquiring company’s CEO.

(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 336) when available. Book value of assets is total assets (item 6).<sup>17</sup> Further, we use fiscal year closing prices (item 199) adjusted for stock splits (item 27) to calculate annual stock returns. We also use CRSP to gather stock prices and SIC codes. Missing accounting data (largely from financial firms) leaves us with a final sample of 394 firms. As in Malmendier and Tate (2005), we trim cash flow at the 1 percent level to ensure that our results are not driven by several extreme outliers. However, all results can be replicated with the full data. The outliers only influence the estimates at all in the quintile regressions in Subsection D and only in the (interior) quintiles of lesser interest.

In addition, we collect personal information about the CEOs in our sample using *Dun and Bradstreet* and *Who's Who in Finance and Industry*. We broadly classify a CEO's educational background as financial, technical or miscellaneous. We classify CEOs as having finance education if they hold undergraduate or graduate degrees in accounting, finance, business (including an MBA), and economics. CEOs have technical education if they hold undergraduate or graduate degrees in engineering, physics, operations research, chemistry, mathematics, biology, pharmacy, and other applied sciences.

Table 1 presents summary statistics of the data. Panel A presents firm-specific variables and Panel B CEO-specific variables, both for the full set of CEOs and for the subset of CEOs whom we classify as overconfident based on their option-exercise behavior ("Longholder"; see the next section). The mean, median and standard deviation of all variables are remarkably similar for Longholder and non-Longholder CEOs; only the number of vested options that have not been exercised is considerably higher among Longholder CEOs. This difference could stem from overconfidence, as we will see later, but, regardless, we will control for the level of vested options in all of our regressions. Panel C presents the summary statistics of the CEOs' press coverage. While the mean and median number of annual mentions in the selected business publications are relatively high (8.89 and 3 respectively), the mean and median number of annual mentions with the attributes "confident" or "optimistic" or any of "reliable," "cautious," "conservative," "practical," "steady," and "frugal" are low (the means are below 0.1 and the medians are zero). As a result, our analysis will use dummy variables which indicate differences in the number of mentions of each type, in lieu of the raw numbers of articles in each category. Finally, Panel D presents summary statistics of the mergers undertaken by CEOs in our sample. Notably, the

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<sup>17</sup>Definitions of Q and its components as in Fama and French (2002).

acquiror’s stock has a negative cumulative abnormal return of 40 basis points on average over the three day window surrounding the announcement of a merger bid.

### III Measuring Overconfidence

#### A Personal Portfolio Decisions

We use the panel data on CEOs’ personal portfolios to identify differences across managers in executive option exercise. Options granted as part of CEOs’ compensation give executives the right to purchase company stock, usually at the stock price on the grant date (“at the money”). Most executive options have a ten year life span and are fully exercisable after a four-year vesting period. Upon exercise, the CEO receives shares of company stock. These shares are almost always immediately sold (Ofek and Yermack (2000)).

Merton (1973) shows that investors should not exercise options early since the right to exercise options prior to expiration always has non-negative value, and investors are free to diversify. However, this logic does not apply to executive options. Executive options are non-tradeable and CEOs cannot hedge (legally) the risk of their holdings by short-selling company stock. Moreover, CEOs are heavily invested in their company since they receive large quantities of company stock as part of their compensation and their human capital is invested in their firm. As a result, risk-averse CEOs should generally exercise options early given a sufficiently high stock price (Lambert et al. (1991); Hall and Murphy (2002)). The threshold for early exercise equates the marginal benefit of continuing to hold the option (option value) with the marginal cost (risk exposure). The exact threshold depends on remaining option duration, individual wealth, the degree of underdiversification, and risk aversion. But, the high degree of underdiversification among our FORBES 500 CEOs implies fairly low thresholds given reasonable calibrations of wealth and risk aversion.

Some CEOs in our data persistently fail to exercise highly in-the-money vested options despite these strong incentives to diversify. We construct three indicator variables which partition our CEOs into “late” and “timely” option exercisers. We then discuss several reasons why CEOs may hold options longer than rational models for executive option exercise would predict, including overconfidence.

**Longholder.** Our first indicator identifies CEOs who, at least once during their tenure, 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). For an option that is 40 percent or higher in the money, the option value from holding is lower than the benefit of diversification.<sup>18</sup> The particular choice of parameter values is not important for our results: The median percentage in the money entering the final year for options held to expiration is 253 percent. Any assumption from no threshold at all to a threshold of 100 percent in the money would yield similar results.<sup>19</sup>

We first apply this measure as a managerial fixed effect, denoted “Longholder.” As such, it inherently incorporates forward-looking information. We construct two alternative indicators of late exercise which (1) allow for time variation over a manager’s sample years and (2) eliminate forward-looking information from the classification scheme.

**Pre-Longholder / Post-Longholder.** We split the Longholder indicator into two separate dummy variables: Post-Longholder is 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.

One shortcoming of the Post-Longholder measure is its lack of power. Only 42 percent of the observations where Longholder is 1 fall into the Post-Longholder category, capturing 74 mergers. This effectively excludes the Post-Longholder measure from tests that require us to subdivide mergers into finer categories (i.e. cash mergers versus stock mergers or diversifying mergers versus intra-industry mergers).

**Holder 67.** We also construct a purely backward-looking alternative to the Post-Longholder measure: Holder 67.<sup>20</sup> Here we relax the requirement that CEOs hold their options all the way until expiration and focus instead on the fifth year prior to expiration. Five years before expiration is, in fact, the earliest point we can consider since many of the options in our sample are 10 year options that are fully vested only after year 4. Maintaining the previous assump-

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<sup>18</sup>We refine the Longholder measure in Malmendier and Tate (2005) with this additional restriction. The restriction does, however, not have much impact on the results (see Figure 1, e.g., in the NBER working paper version of this paper #10807).

<sup>19</sup>We do not calculate a separate threshold for every option package in our sample – depending on the CEO’s wealth, diversification, and risk aversion. As we cannot observe each CEO’s degree of risk aversion and wealth or the fraction of his total wealth invested in company equity, individual calibration would introduce a great deal of observation-specific noise into the estimation without clear benefits.

<sup>20</sup>The definition of Holder 67 here has several differences from the definition in Malmendier and Tate (2005), though the basic intuition is the same. The biggest difference is the removal of all forward-looking information from the definition.

tions on constant relative risk aversion and diversification, the new exercise threshold (in the Hall-Murphy framework) is 67 percent in the money. We set the measure Holder 67 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 grant date. As above, the results are robust to variation in the value of the threshold.

When we use this variable, we consider only CEOs who could have been classified as Holder 67. A CEO enters the sample once he has an option with 5 years remaining duration that is at least 67 percent in the money. And once a CEO decides to postpone the exercise of such options he is classified as Holder 67 and retains that label for the remainder of his sample years. We further exclude from the analysis the small number of option packages that have 5 years remaining duration but are not fully vested.<sup>21</sup> Overall, the sample restriction leaves 1667 of our original 3911 observations.

Because of the less stringent requirements under the Holder 67 measure, there are more “late exercise” CEO years and more completed mergers (232) in those CEO years than under the Post-Longholder measure. Thus, this measure is more appropriate for estimations that require us to partition the mergers into smaller groups.

In Panel B of Table 1, we show CEO summary statistics for the subsamples of firm years with Longholder CEOs. In Table 2, we report the pairwise correlations between the Longholder measure and firm and CEO characteristics. (The patterns are similar for the other portfolio measures.) There is little correlation of our portfolio measures with firm and CEO characteristics. The only two variables with a correlation higher than 0.1 with Longholder are CEO tenure and vested options. These correlations arise mechanistically. Since classification as a Longholder requires the CEO to hold an option (typically for ten years) to expiration, CEOs with long tenure are more likely to be identified.<sup>22</sup> This correlation does not arise for Holder 67. The (untabulated) correlation between Holder 67 and tenure is  $-0.012$ . Similarly, failure to exercise aggregates into a higher level of option holdings among Longholders (the correlation between Holder 67 and vested options is 0.21). This correlation suggests that the levels of CEO stock and vested option holdings might also serve as proxies for excessive exposure to company

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<sup>21</sup>These cases most often involve the rare options in our sample which are granted with fewer than 10 years duration.

<sup>22</sup>Unidentified overconfidence among short-tenured CEOs may in fact attenuate our estimates of the Longholder effect on acquisitiveness.



risk. However, the level of holdings confounds the influence of boards on compensation and contract provisions with CEO trading decisions and beliefs. It is, therefore, difficult to interpret. Regardless of the explanation for these correlations, we control for ownership (and tenure) in our estimations to prevent their direct effects from contaminating our results.

Finally, we find that the different measures of failure to exercise are significantly correlated with each other: the correlation between Longholder and Holder 67 is 0.47.

## B Interpretation

There are many reasons why CEOs may hold options even when rational models of exercise would suggest they diversify their holdings. In this section, we consider several possible interpretations of late option exercise and assess (1) their consistency with the evidence and (2) their ability to generate a link between late option exercise and merger decisions.

1. *Taxes.* CEOs may delay the exercise of in-the-money options to postpone the payment of taxes on their profits. Personal income tax deferral, however, makes no direct prediction for behavior on corporate accounts and, specifically, for merger decisions.

2. *Board Pressure (and corporate governance).* Board pressure can explain both delay in option exercise and merger decisions. Directors may pressure CEOs to hold (exercisable) in-the-money options to signal the relative quality of the firm's merger deals to the market. If this signaling is effective, the market should prefer the merger deals of option-holders to exercisers. We find in Section VI that the opposite is the case, making board-induced rational signaling unlikely. However, there are two remaining possibilities: boards have incorrect beliefs about the signaling value of holding options; or option holding does have positive signaling value and the market would have reacted even worse had the CEOs exercised their options. There is no evidence which directly addresses either of these stories. However, we can account for firm-specific board effects. The composition of boards in our data is remarkably stable over time.<sup>23</sup> Thus, the inclusion of firm fixed effects controls for differences in board influence across firms. More generally, it removes the influence of any unspecified firm-level variation in corporate governance on late option exercise and merger decisions.

3. *CEO Preferences (Risk Tolerance/Procrastination).* Some CEOs may be more risk-tolerant than the CRRA utility function used to calibrate rational exercise thresholds assumes. CEOs

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<sup>23</sup>See, e.g., Guner, Malmendier, and Tate (2006).

who are risk neutral – or who manage to perfectly hedge the risk of their options despite the prohibition of trading and short sales – may delay option exercise until expiration. These CEOs may also be inclined to undertake risky projects like mergers. Shareholders, however, should prefer a risk neutral CEO over a risk-averse CEO since they can diversify their portfolios. Since risk neutral CEOs would use a first-best investment rule, the market should react positively to their merger bids. We find, instead, that the market reacts negatively.

Two variations of the risk-tolerance argument remain plausible candidates for our baseline findings: (1) Option-holding CEOs are risk seeking; (2) some other friction induces value-destroying mergers and less risk-averse managers are more susceptible to it. These variations fail, however, to explain our additional findings: First, neither predicts that such managers are more prone to diversify the company’s cash flows via diversifying acquisitions (Section C). And, second, neither predicts a managerial aversion to stock financing (Section D).

Another preference-based explanation for late exercise is “inertia” in the sense of O’Donoghue and Rabin (2001). However, more than 68 percent of Longholders conduct other transactions on their personal portfolios in the two years prior to the year their “longheld” option expires. Moreover, “inertia” cannot explain the link between Longholder and Holder 67 and increased merger frequency (see Section IV).

4. *CEO Beliefs (Information/Overconfidence/Signaling)*. Finally, CEOs may delay option exercise because they believe that their stock will perform strongly and they want to profit personally from the expected appreciation.<sup>24</sup> These beliefs may be correct: CEOs may have persistently positive inside information that their companies’ stock is undervalued. Or, they may be incorrect. We refer to CEOs with incorrect beliefs as overconfident. In either case, if the positive beliefs are about potential mergers, they can link late exercise to merger decisions.

Several pieces of evidence can distinguish information from overconfidence. If (unpriced) inside information drives late option exercise, the returns obtained by holding on to the options should be higher than the returns to diversification. In Table 3, we calculate the hypothetical returns that Longholder CEOs could have realized had they exercised their options one year before expiration and invested the proceeds in the S&P 500. Allowing for maximum insider knowledge, we assume that both the hypothetical exercise and actual exercise occur at the maximum stock price during the fiscal year. We find that, on average, Longholder CEOs

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<sup>24</sup>As a rough measure of the stakes involved for the CEO, we multiply the current stock price times the number of options remaining in the package entering the expiration year. The average value is \$5,465,086.

did not profit by holding until expiration compared to this alternative strategy. Indeed, the average return to exercising a year earlier is positive, though statistically insignificant. We also replicate these results assuming hypothetical exercise 2, 3, 4, and 5 years before expiration.<sup>25</sup> The average CEO would have done better under all four alternative strategies than by holding to expiration. We also make a similar calculation for the Holder 67 measure. We find, again, no evidence that CEOs have positive information about future stock prices. In this case, we compute the returns from exercising in year 5 when the option has passed the 67 percent threshold and investing the proceeds in the S&P 500. We then compare those returns to the returns the CEO actually obtains by holding the options until the next year in which he exercises any options in the package. The mean difference in returns is  $-0.0049$  with a standard deviation of  $0.2997$ . Thus, CEOs who hold in-the-money stock options do not earn abnormal returns over the S&P 500 index on average. So, the link between Longholder (or Holder 67) and mergers is unlikely due to inside information, on average.

We also take two different approaches within our regression analysis to isolate as much as possible the impact of information-driven late exercise on mergers from the impact of overconfidence. First, we decompose Longholder into CEOs who make losses from their failure to exercise and CEOs who do not. While the “winning” CEOs may indeed have inside information, the behavior of “losing” option holders is more plausibly due to incorrect beliefs (overconfidence) than real private information. We will find in Section IV that the link between late exercise and merger activity comes primarily via the latter group. Second, we exploit the properties of the Post-Longholder and Pre-Longholder partition of the Longholder variable. We can use Post-Longholder to isolate differences in acquisitiveness among late-exercising CEOs which occur after their options expire. This disjoint timing of option-holding and mergers is more difficult to reconcile with an information story since the information causing late exercise cannot be information about the merger itself.

Finally, CEOs may hold options to signal positive information to the market. It is difficult, however, to reconcile the assumption that option holders have the best prospects (which is necessary for the signaling story)<sup>26</sup> with the empirical finding that investors react more nega-

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<sup>25</sup>We also increase the threshold for inclusion in the profits calculation by 0.05 per year to account for the increase in the Hall-Murphy threshold as remaining duration on the option increases. That is, we only propose that the CEO exercise if the option is beyond the relevant Hall-Murphy benchmark (approximately) for the year in question.

<sup>26</sup>We can dispense with this assumption if CEOs without real information nevertheless try to (irrationally) signal by holding options. We view such behavior as a symptom of incorrect beliefs (overconfidence) rather than

tively to their merger bids than to the bids of other CEOs. The Post-Longholder measure also allows us to separate the decision to hold in-the-money options from acquisitions. Using the Post-Longholder measure, we relate late option exercise to merger decisions that occur after the in-the-money options expire. Thus, any link between late exercise and mergers through the Post-Longholder variable is unlikely to be due to CEO signaling behavior.

We have considered a number of explanations for the delay in option exercise captured by the various “Holder” measures. Several of these explanations do not predict increases in merger activity. Other theories make additional predictions that do not appear to be supported by the data. Overconfidence, instead, is consistent with all of our evidence. Thus, we interpret Longholder, Pre- and Post-Longholder, and Holder 67 as measures of overconfidence.<sup>27</sup> Through the course of our analysis, we will provide additional evidence on several of these explanations. In addition, we will introduce a second, media-based overconfidence proxy that is unlikely to be confounded by explanations like tax exposure and board pressure.

## IV Overconfidence and Acquisitiveness

Our empirical analysis relates the personal portfolio decision-making of CEOs to their corporate decision-making. The overconfidence model predicts higher acquisitiveness among overconfident CEOs (i) if their companies are cash-rich or have unexhausted debt capacity; and (ii) for the subset of value-destroying mergers. We will begin our analysis, though, by asking whether overconfident CEOs make more acquisitions even unconditionally. While such a finding is not necessary to confirm the overconfidence hypothesis, it would indicate that overconfidence plays a significant role in explaining merger activity.

Figures 1 and 2 display the time series of merger frequencies for Longholder CEOs and for the rest of our sample.<sup>28</sup> Figure 1 shows that the portion of Longholder CEOs making an acquisition is higher in the vast majority of years, often significantly so (up to 414 percent of the comparison value). Overall, we have 108 instances of a Longholder CEO doing at least one merger in a year out of 662 firm-years with Longholder CEOs. For almost five times as many

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a distinct interpretation of late exercise.

<sup>27</sup>Alternatively, one may call a CEO who overinvests in his company and who does too many and bad mergers simply “stupid” or low-skill. Since the biased managerial decisions systematically point to *overestimation* of future returns, “overconfidence” simply characterizes the type of mistake more tightly.

<sup>28</sup>The picture is similar with the alternative measure.

(3249) firm-years with a rational CEO we observe only three times as many (343) years with mergers. The picture is even stronger for the actual number of mergers (Figure 2). Longholder CEOs surpass their rational peers in all but two years. On average, they perform a merger almost every fifth year, while rational CEOs do a merger about every ninth year.<sup>29</sup>

## A Empirical Specification

Building on this suggestive evidence, we test whether overconfident CEOs are more acquisitive using the following regression specification:

$$\Pr\{Y_{it} = 1|O_{it}, X_{it}\} = G(\beta_1 + \beta_2 O_{it} + X_{it}'B) \quad (3)$$

$O$  is the overconfidence measure and  $X$  a set of controls.  $Y$  is a binary variable that takes the value 1 if the CEO made at least one successful merger bid in a particular firm year. Throughout the paper, we assume that  $G$  is the logistic distribution.<sup>30</sup> The null hypothesis is that  $\beta_2$ , the coefficient on the overconfidence proxy, is equal to zero. Note that the theory motivates one-sided hypothesis tests. However, throughout the empirical section, we report the results of two-tailed tests. So, for example, significance at the 10 percent level can be interpreted as significance at the 5 percent level for the theoretically derived one-sided test.

The Longholder measure identifies the effect of overconfidence on acquisitiveness out of two types of variation: cross-sectional and within-firm variation. As an example for the first type, consider the case of Wayne Huizenga, CEO of Blockbuster Entertainment Group for all 7 years the firm appears in our data. Since he holds some options until the year of expiration, we classify him as overconfident. He also conducts 7 acquisitions during those 7 years. Similarly, David Farrell is CEO of May Department Stores – the holding company of Lord & Taylor, Filene’s, and Robinsons-May, among others – for the 15 years the firm appears in our sample and is classified as overconfident. He conducts 5 mergers during those 15 years. By contrast, J. Willard Marriott of Marriott International is CEO of his company for all 15 years of our sample, but never holds an option until expiration. He also never conducts an acquisition. By comparing these two types of CEOs, we can identify a cross-sectional effect of overconfidence on acquisitiveness. As an example of within-company variation, consider Colgate Palmolive.

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<sup>29</sup>The figures are virtually identical for merger bids (instead of completed mergers).

<sup>30</sup>Wherever econometrically possible, we confirmed the robustness of the estimates to the assumption that  $G$  is normal.

For the first 4 years, the CEO is Keith Crane. Crane never holds an option until expiration and he never conducts an acquisition. Reuben Mark succeeds him as CEO in 1984. Over the next 11 years, he holds some options until the year of expiration and he also conducts 4 acquisitions. So, by comparing overconfident and rational CEOs within the same firm, we might also identify a positive effect of overconfidence on acquisitiveness.

The Holder 67 measure, on the other hand, can vary within-CEO. It exploits changes in a particular CEO's option exercise behavior in addition to the two sources of variation described above. Longholder Wayne Huizenga, for example, does not exercise two option packages that have passed the 67 percent threshold with 5 years remaining duration, with the first instance in 1989. From 1987 to 1989 – before he is classified as overconfident under the Holder 67 measure – he does 4 acquisitions. From 1990 through 1994, he does another 3. Similarly, David Farrell, a Longholder, fails to exercise an option that has reached the 67 percent threshold with 5 years remaining duration in 1986. From 1980 to 1986, he completes 2 acquisitions. From 1987 through 1995, after he becomes a Holder 67, he does 3 more.

We estimate Equation (3) using three estimation procedures. The first specification, a logit regression, makes use of all of the types of variation. The second, a logit regression with random effects, also uses all the sources of variation, but it explicitly models the effect of the firm, rather than the CEO, on acquisitiveness. Note that if the estimated effects of overconfidence in the logit specification were due to firm effects, we would expect to see a decline in our estimates when we include random effects. Finally, we estimate Equation (3) using a logit regression with fixed effects. This specification makes use only of within-firm and within-CEO variation. That is, we estimate the effect of overconfidence on acquisitiveness using only variation between overconfident and rational CEOs within a particular firm and (in the case of Holder 67) between a particular CEO's overconfident and rational years. To address the incidental parameters problem, we estimate the fixed-effects model with a conditional logit regression. Conditioning the likelihood on the number of successes in each panel, we avoid estimating the coefficients of the fixed effects themselves and obtain consistent estimates of the remaining coefficients. The fixed effects approach eliminates any time-invariant firm effect on average acquisitiveness. The disadvantage of the procedure is that it induces sample-selection bias. Only firms that conduct at least one merger during the sample period are included in the fixed-effects estimation and only firms that had at least one overconfident and one non-overconfident CEO during the sample period (or a CEO who switches from not overconfident

to overconfident under Holder 67) are used to identify  $\beta_2$ . To show that our results neither depend on cross-sectional variation nor on sample selection, we present all three specifications. We cluster standard errors in the pooled and fixed effects logit specifications to account for heteroscedasticity and auto-correlation at the firm level.<sup>31</sup>

## B Merger Frequency

We first estimate the impact of overconfidence on acquisitiveness on our entire sample of firm years. The baseline logit without controls indicates a strong and significant impact of overconfidence on acquisitiveness. The odds of a Longholder CEO making an acquisition are 1.65 times the odds of other CEOs. Specifically, the odds of a non-overconfident CEO making an acquisition are 0.118 while the odds for a Longholder CEO are 0.195. Splitting Longholder into the Pre-Longholder and Post-Longholder components, we find an odds ratio of 1.48 on Post-Longholder. Using Holder 67 as the overconfidence measure, we find an odds ratio of 1.62. The Longholder and Holder 67 effects are significant at the 1 percent level and the Post-Longholder effect is significant at 10 percent.

In Panel A of Table 4, we add the following controls: the logarithm of assets at the beginning of the year as a control for firm size, Tobin's Q at the beginning of the year as a control for investment opportunities, and cash flow as a measure of internal resources. We include two controls for the incentive effects of holding company stock and options: the percent of company equity held by the CEO at the beginning of the year and the number of options exercisable within six months of the beginning of the year, normalized by total shares outstanding. We control for corporate governance in several ways. While recent measures such as the Gompers, Ishii, Metrick index are not available for our 1980-1994 sample period, the data allows us to construct an indicator for efficient board size as a first measure of corporate governance.<sup>32</sup> Second, we include a proxy for CEO power (title accumulation) in the robustness checks below. Finally, the inclusion of firm fixed effects captures much of the remaining variation in

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<sup>31</sup>We also verify the robustness of the results to clustering at the CEO, rather than the firm level. The firm-level clustering reported in the tables is a more stringent requirement, since it allows for the possibility that the all of the firm's errors are correlated. CEO level clustering instead assumes that observations of different CEOs within the same firm are independent.

<sup>32</sup>The corporate governance literature suggests that an effective board should have no more than 12 members. The results are robust to the using of the logarithm of board size or the number (or percentage) of CEOs of other companies sitting on the board as alternative measures of governance.

governance mechanisms, since firm governance is extremely stable over time.<sup>33</sup> All regressions include year effects to control for time trends in the likelihood of conducting a merger. The most consistent effects across all specifications (logit, random effects logit, and conditional logit) are for Q and cash flow. Firms with lower values of Tobin’s Q are more likely to conduct mergers, suggesting that acquisitions may be a substitute for profitable investment opportunities.<sup>34</sup> More cash flow, on the other hand, leads to more acquisition activity, as expected if cash eases financing constraints. Among the other controls, the between and within firm effects appear to go in opposite directions and most estimated coefficients are insignificant. Notably, size appears to have a mechanistic relationship with acquisitiveness within firm. That is, the assets of a firm are necessarily larger after a merger. We re-run the regressions without size to verify that this undesirable effect does not interact with the overconfidence estimates.

The effects of these controls appear to be largely orthogonal to the effect of overconfidence. CEOs who persistently hold options are significantly more acquisitive on average, regardless of the specification. The effect of overconfidence on acquisitiveness is also strong and significant when we include firm fixed effects and identify overconfidence only using variation across CEOs in the same firm or, for Holder 67, within CEO.

Note that including year and firm effects rules out alternative explanations that rely on market-wide variation (such as “bubbles”) or cross-sectional variation (such as consolidation in certain industries). We also estimate an untabulated specification that includes industry fixed effects and the interaction of industry effects with year effects (adjusting standard errors for clustering within industry). Industries are defined as the 48 Fama and French industry groups.<sup>35</sup> This specification allows us to control for the possibility that mergers cluster within industries over time, as argued by Andrade et al. (2001). The effect on the results is again negligible. Overconfidence appears to be a determinant of merger activity across merger waves.

What remains to be discussed are alternative stories that rely on time-series variation within firms. First, CEOs may exploit stock price bubbles to trade their overvalued equity for the assets of the target company (Shleifer and Vishny (2003); Dong et al. (2002)). This story can also incorporate the observed delay in option exercise. Managers may want to

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<sup>33</sup>See Guner et al. (2006) for a detailed analysis of board composition in a closely related data set.

<sup>34</sup>This effect appears to be non-monotonic. For example, we find a positive and marginally significant coefficient when we include a dummy variable for “high Tobin’s Q.” ( $Q > 1$ ) Alternatively, including the square of Tobin’s Q reverses the direction of the level effect (though it remains insignificant).

<sup>35</sup>See Ken French’s website [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).



reap the benefits of the bubble (though their portfolio performance suggests that they are not successful). Or they may want to avoid “popping” the bubble with a negative signal. To address this possibility, we check whether merger frequency covaries with the stock price of a firm and whether controlling for this effect reduces the estimated coefficient of overconfidence. We add five lags of stock returns ( $t - 1$  to  $t - 5$ ) to our set of controls in Equation (3). We find that the simple lag of returns ( $t - 1$ ) does increase acquisitiveness in most specifications. However, our estimates of the effects of overconfidence on acquisitiveness are entirely unaffected both in terms of economic and statistical significance for any of the three overconfidence proxies.

Second, CEOs may hold options longer than their peers when their companies’ stocks are more volatile. High volatility of the underlying asset increases option value and the threshold for exercise. We can link this behavior to increased acquisitiveness if these CEOs conduct mergers to diversify the corporate account (Amihud and Lev (1981)). Indeed, we will show in Subsection C that much of the acquisitiveness of overconfident CEOs is due to diversifying mergers. We re-estimate Equation (3) controlling for company-specific return volatility over the prior year. We find that volatility has no explanatory power for the time series of merger activity within a firm. Further, the estimated overconfidence coefficient is virtually unchanged.

Third, we test for effects of dividend policy. CEOs in firms that do not pay dividends have less incentive to exercise options. If firms become less likely to pay dividends after mergers, time series variation in dividend payments might explain our results. We re-estimate Equation (3) adding the dividend rate per share as an additional control. The results are unchanged.

Fourth, we test whether other personal characteristics might drive both sub-optimal option exercise and excess acquisitiveness. We consider educational background, age, CEO tenure, and title accumulation (President and Chairman of the Board in addition to CEO). Tenure is a particularly important control given the correlation with Longholder reported in Table 2. We find that finance education has a positive impact on acquisitiveness, but is orthogonal to overconfidence. The other CEO characteristics (titles, age, tenure) are not individually significant and do not impact the estimated effect of overconfidence on acquisitiveness. Thus, it is unlikely that our option-holding measures capture a CEO characteristic other than overconfidence.

Finally, we distinguish between Longholder CEOs who earned negative abnormal returns from holding on to their options and those who did not. Using the return calculations from Table 3, we categorize Longholder CEOs into the group “Did OK” if, more often than not, they earned positive profits over the S&P 500 when they held an option to expiration. The

remaining Longholder CEOs (“Should have exercised”) would, more often than not, have done better by diversifying. We re-estimate Equation (3) replacing Longholder with these two component variables. We find that the increased acquisitiveness explained by Longholder is not concentrated among the CEOs who earn positive profits by holding their options (Table 4, Panel B). While the difference between the two groups is not significant, the significant effect of the “loser group” suffices to address the inside information interpretation of our results.

Thus, the regressions confirm the results displayed in Figures 1 and 2. CEOs who fail to exercise highly in-the-money stock options are more acquisitive on average than their peers. The overconfidence interpretation is consistent with this evidence, as are other theories of excess acquisitiveness and option exercise. The additional evidence in the following subsections allows us to distinguish overconfidence from other preference- and belief-based explanations.

### C Diversifying Mergers

According to our model, overconfident managers are more likely than rational managers to undertake a merger project with negative expected returns (Prediction 1). To test this prediction, we attempt to identify a subset of mergers that, *ex ante*, is unlikely to create value. We focus on diversifying mergers. A large academic literature on the diversification discount provides support for this assumption.<sup>36</sup> Addressing concerns about pre-existing discounts of diversified firms or econometric and data biases,<sup>37</sup> detailed plant-level data confirms the negative impact of diversification via acquisition (Schoar, 2002). In addition, the market seems to recognize in advance that many diversifying bids are unwise. Morck et al. (1990) document a negative announcement effect to diversifying deals, an effect we confirm in our data.<sup>38</sup>

Using diversification as a first proxy for mergers with negative expected value, we estimate Equation (3) with a dependent variable that indicates a diversifying merger bid, *i.e.* where acquiror and target firms are not members of the same Fama-French 48 industry group. We also estimate Equation (3) for intra-industry bids. As before, we analyze merger bids that were ultimately successful. However, since the likelihood of failure may differ across diversifying and intra-industry mergers, we also perform the estimations including unsuccessful merger

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<sup>36</sup>E.g. Lang and Stulz (1994), Berger and Ofek (1995), Servaes (1996), and Lamont and Polk (2002).

<sup>37</sup>E.g. Graham, Lemmon, and Wolf (2002) and Villalonga (2004).

<sup>38</sup>Further suggestive evidence comes from Lys and Vincent (1995) and Shefrin (2000), who chronicle AT&T’s 1990 acquisition of NCR using exactly this paradigm. Reassuringly, the Longholder measure identifies AT&T’s CEO (Robert Allen) as overconfident.

bids. None of our conclusions in this Section (as elsewhere in the paper) are affected.

Table 5 shows that overconfident managers are far more likely to do diversifying mergers than rational managers, under either the Longholder or the Holder 67 measure. In the fixed effects logit specification, the odds ratio on the Longholder measure of overconfidence is 2.54. The effect of Longholder on the likelihood of making a related bid is positive (1.66), but insignificant. Similarly, for the Holder 67 measure we obtain an odds ratio of 2.72 for doing a diversifying merger in the fixed effects specification, but only 0.84 for within-industry mergers.

The evidence on the significance of these differences is mixed. We first use a seemingly unrelated estimation framework, which allows us to test cross-model hypotheses while accounting for the stochastic dependence of the coefficient estimates. We find that the Longholder coefficient estimates in the pooled logit specification are not significantly different; the p-value is 0.31. The difference in the Holder 67 estimates is also insignificant, though the p-value is substantially lower (0.17). In the fixed effects specifications, the p-value for the difference in Longholder coefficients is 0.43, while for Holder 67 it is 0.08. Alternatively, estimating a linear probability model, we find that all differences are significant at the 10 percent level, save the Holder 67 specification with fixed effects (p-value = 0.1026).

Note that Prediction 1 is silent on the significance of these differences. The theory only predicts that overconfident managers are more likely than rational managers to conduct negative expected value acquisitions. Taking diversification as a proxy for negative expected value, our result confirms this prediction. Longholder and Holder 67 CEOs are significantly more likely to conduct such deals, but not within-industry (or positive expected value) mergers.

## **D Internal Resources**

Our second prediction is that the effect of overconfidence on acquisition decisions is most pronounced in firms with abundant internal resources (cash and safe debt). If a firm can finance an acquisition without issuing equity, perceived undervaluation by the capital market will have less of an effect on the CEO's enthusiasm for the merger. An overconfident CEO might also prefer risky debt to equity. While he may disagree with the market about the probability of bankruptcy and, thus, view debt as too expensive, he retains more rights to the (perceived) upside with risky debt than with equity.

To test this prediction, we employ the Kaplan-Zingales index. Kaplan and Zingales (1997) use information from annual reports and company executives to measure financing constraints.

They then estimate an ordered logit of this classification on five accounting ratios related to financial constraints: cash flow to total capital, Q, debt to total capital, dividends to total capital, and cash holdings to capital. Recent research (Baker et al. (2003); Lamont et al. (2001); Malmendier and Tate (2005)) uses the estimates to construct an index of financial constraints (or equity dependence) as follows:

$$KZ_{it} = -1.001909 * \frac{CF_{it}}{K_{it-1}} + 0.2826389 * Q_{it} + 3.139193 * Lev_{it} - 39.3678 * \frac{Div_{it}}{K_{it-1}} - 1.314759 * \frac{C_{it}}{K_{it-1}}.$$

Higher values imply higher equity dependence.<sup>39</sup> Prediction 2 is confirmed if the effect of overconfidence is strongest for the firms with the lowest values of the Kaplan-Zingales index. Since the capital structure of a firm may change endogenously in anticipation of (or preparation for) a merger, we use the value of the index at the beginning of the year preceding the merger.

We divide our sample into quintiles of the Kaplan-Zingales index and estimate random effects logit regressions of Equation (3) separately on each quintile.<sup>40</sup> The results of our estimation, using the Longholder proxy, are in Table 6. The dependent variable indicates that the firm made at least one successful bid in a particular firm year. As predicted, we find a positive and significant effect of overconfidence in the “least constrained” quintile (the odds ratio on overconfidence is 2.03) and no significant effect in the “most constrained” quintile (the odds ratio is 1.07). The large difference is not due to a lack of sufficient mergers to identify the effect in the most constrained quintile: the number of successful bids is actually larger in the bottom quintile (72 versus 91). A Wald test fails to reject equality of the estimates at conventional levels (p-value = 0.133). However, our prediction is on the difference between overconfident and non-overconfident CEOs given the degree of financial constraint. So, this failure does not affect our conclusions: The effects of overconfidence on acquisitiveness are strongest for managers with abundant internal resources.

The data also confirms the financing implications of our model. We find that Longholder CEOs are more likely, conditional on conducting a merger, to finance it using cash and debt (Panel A, Table 7). The odds ratio of using cash versus any mixture of risky securities with cash

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<sup>39</sup>For this test, we use the definition of Q employed by Kaplan and Zingales (1997) to avoid rendering the weights meaningless. The COMPUSTAT data items are: cash flow to capital = (item 18 + item 14) / item 8 ; Q = [item 6 + (item24 \* item 25) - item 60 - item 74] / item 6 ; debt to capital (leverage) = (item 9 + item 34) / (item 9 + item 34 + item 216) ; dividends to capital = (item 21 + item 19) / item 8 ; cash to capital = item 1 / item 8. Item 8, capital, is always taken at the beginning of the year (lagged).

<sup>40</sup>The effects using pooled logit are similar. Fixed effects logit is not feasible since quintiling the sample leaves us with too few identifiable cases in some subsamples.

is 1.10. It is even stronger for the Holder 67 measure (1.38; untabulated). We also examine the effect in a regression framework, controlling for market over- and undervaluation, Tobin’s Q, stock and vested option ownership, merger size, financial constraints and year effects in various combinations. The odds ratio increases to 1.2 but remains insignificant. (It is 1.7 and significant at the 10 percent level for Holder 67.) Moreover, overconfident CEOs are significantly more likely than rational managers to conduct a cash acquisition when the firm is unlikely to be overvalued, as captured by Tobin’s Q being less than the (within-sample) industry average. The interaction of undervaluation and Longholder is significant across specifications. These results confirm that overconfident managers are particularly sensitive to (perceived) market undervaluation and are also consistent with the view that investor sentiment affects merger financing decisions, as in Shleifer and Vishny (2003).

## V Overconfidence and the Press

So far, we have used CEOs’ personal portfolio decisions to identify differences in beliefs between managers and outsiders about the firms’ future prospects. We now ask which CEOs outsiders perceive to be “confident” and “optimistic.” Our proxy for market perception uses press coverage in leading business publications: *The Wall Street Journal*, *The New York Times*, *Business Week*, *Financial Times*, and *The Economist*. Replicating our results with a proxy based on press portrayal serves two purposes. First, it is a robustness check and helps to rule out alternative explanations for our portfolio-based results. Second, it provides insight into the type of person we are capturing as overconfident. It would be worrisome if the typical Longholder CEO were characterized as “cautious” and “frugal.” While necessarily noisy and less precise, the strength of the press measure is that it complements our previous results, measuring CEO beliefs from the alternative perspective of corporate outsiders.

Using the press data described in Section II, we compare, for each year, the number of articles that refer to the CEO using the terms (a) “confident” or “confidence” and (b) “optimistic” or “optimism,” to the number of articles that portray him as (c) “not confident,” (d) “not optimistic,” and (e) “reliable,” “cautious,” “conservative,” “practical,” “frugal,” or “steady.” Then, we construct the following indicator for each CEO year (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 calculate *TOTALconfident* using all sample years of a CEO up to (and including) the previous year. Note that, as with the Holder 67 measure, *TOTALconfident* captures not only between-firm and within-firm variation in CEO types but also variation within CEO. We control for the total number of press mentions over the same period (*TOTALmentions*)<sup>41</sup> since a press bias towards positive stories might imply a higher number of mentions as “confident” or “optimistic” when the total number of mentions is high.

Press coverage suffers from an important endogeneity problem: past mergers may change the tenor of future press coverage. The press may be more likely to perceive CEOs who have conducted mergers as confident and optimistic. Similarly, managers may try to convey confidence and optimism to the press during merger bids. To address this concern, we employ a duration model, restricting the sample to observations up to (and including) each CEO’s first merger (if any). We drop executives who became CEO before the beginning of the sample period to make sure that we properly identify each CEO’s first merger (and all press mentions during his tenure). The duration model tests whether press coverage as “optimistic” or “confident” shifts up the hazard for exiting the “no past mergers” state. Our logit regression includes dummy variables for each year spent in the “no past mergers” state, the *TOTALconfident* measure, and the *TOTALmentions* control.

We also address the concern that personal characteristics other than overconfidence may be driving differential press coverage. We use hand-collected data, described in Section II, to control for educational background, age, and title accumulation (Chairman, President). Here, finance education is binary and equals 1 if the CEO had “financial education” (undergraduate and graduate degrees in accounting, finance, business (including an MBA), and economics). Technical education is binary and equals 1 if the CEO had “technical education” (undergraduate and graduate degrees in engineering, physics, operations research, chemistry, mathematics, biology, pharmacy, and other applied sciences). Adding these additional controls reduces the sample size; thus, we report specifications with and without CEO-level controls.

Table 8 displays the correlations of the press measures and various firm and CEO character-

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<sup>41</sup>Alternatively, we calculate *TOTALconfident* for the past year and control for the total number of mentions in the same period.

istics. Panel A reports a positive correlation between TOTALconfident and the portfolio-based overconfidence measures. Both the correlation of Longholder and Holder 67 with TOTALconfident are statistically significant at the 1 percent level. The TOTALmentions control displays instead insignificant (zero or negative) correlation with our portfolio overconfidence measures. Panels B, C, and D display the correlations of TOTALconfident with various firm and CEO characteristics. As with the portfolio measures, there are few strong patterns. Notably, the correlation of our portfolio measures with vested option holdings is not replicated here. However, this measure, unlike the portfolio measures, has a strong correlation with firm size. It is, therefore, especially important that we include size as a control in regressions using the TOTALconfident measure.

We then repeat our prior empirical analysis, substituting TOTALconfident for the portfolio measures of overconfidence. Table 9 reports the results of estimating the duration model. We find that CEOs portrayed as “confident” and “optimistic” have 1.7 times higher odds of conducting their first merger at any point in time. Controlling for the set of CEO characteristics increases the odds ratio to 2.2. Both estimates are significant, the latter at the 5 percent level. The odds ratio is similar in magnitude when we control for firm fixed effects, but the test is not sufficiently powerful (with only 371 identifiable observations and 79 firms) for us to reject the null hypothesis of a zero marginal effect.

In columns (3) to (6), we replicate the test of Prediction 1 from Subsection IVC, using diversification as a proxy for negative expected value. Within the duration framework, we find that TOTALconfident predicts heightened odds of exiting the “no merger” state by conducting a diversifying deal, but not by conducting an intra-industry merger. The odds ratios are 2.2 (no CEO controls) and 2.8 (with CEO controls) for diversifying mergers, significant at the 10 and 5 percent levels respectively. On the other hand, the odds ratios are less than 1.5 and insignificant for within-industry mergers.<sup>42</sup>

We also re-measure the effect of overconfidence conditioning on internal resources (Prediction 2). Estimating Equation (3) separately on quintiles of the Kaplan-Zingales index would

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<sup>42</sup>Note that the coefficient estimates for the vested options control are very unstable in these regressions and, in particular, blow up when we add CEO controls. We therefore check the specification to make sure that multicollinearity or extreme outlier observations are not responsible for the results. We find no evidence that problems with the vested option control impact the TOTALconfident coefficient estimates. Similarly, the baseline hazards blow up in the industry, no CEO controls specification. This effect appears to arise due to a multicollinearity with the size variable. Excluding size from the specification, however, has no impact on the TOTALconfident coefficient estimate.

require us to split the already drastically reduced press data set into subsets of about 140 firm-years (for the CEO controls sample). To avoid this loss of power, we consider the two highest and the two lowest KZ quintiles jointly and find results similar to Subsection IVD. That is, “confident” and “optimistic” press portrayal increases the odds of doing a first merger in cash-rich firms, but not in equity dependent firms.

Finally, we note that press coverage as “optimistic” and “confident” not only predicts acquisitiveness, but also strongly predicts increased sensitivity of corporate investment to cash flow, particularly among the most equity dependent firms. Malmendier and Tate (2005) show that similar portfolio measures of overconfidence predict heightened sensitivity of corporate investment to cash flow, particularly among equity dependent firms. In untabulated results, we replicate this analysis with a simplified version of the TOTALconfident measure (calculated only once for the full sample period per CEO).

These results corroborate the explanatory power of overconfidence for mergers in several ways. First, they show that, whether we measure differences in beliefs between the manager and the market using managerial portfolio decisions or market perception (as reflected in press coverage), the effect on merger activities is the same. Second, the press results suggest that the market recognizes managerial overconfidence as assumed in our theory framework. Finally, the results confirm that the overconfidence measures capture aspects of the CEOs’ personalities rather than an omitted firm effect. While we have addressed this possibility for the portfolio measures using controls and firm fixed effects, the press measure provides direct evidence: the searches are for executive personality features. Framed differently, the press results provide a crucial insight into the type of executive captured by our portfolio measures of overconfidence.

## **VI Market Reaction to Overconfidence**

Overconfident CEOs tend to overbid and to engage in value-destroying mergers. They also forego some value-creating mergers when perceived financing costs are too high. As a result, the market reaction to merger bids of overconfident CEOs should be significantly more negative than the reaction to the bids of other CEOs (Prediction 3). We evaluate the differential market reaction to merger announcements using event study methodology (Brown and Warner (1980) and (1985); MacKinlay (1997)). In conducting this test, we assume that any market frictions and inefficiencies that are important in the merger context (Shleifer and Vishny,



2003; Mitchell, Pulvino, and Stafford, 2004) affect equally firms with overconfident and non-overconfident CEOs, at least after controlling for an array of firm characteristics (relatedness of the target and acquiror, ownership stake of the acquiring CEO, corporate governance of the acquiror, method of financing). In particular, we assume that information revelation about stand-alone values is the same for all firms. Under this assumption, the announcement effect tests Prediction 3 and also measures differential value-creation (or destruction) by overconfident CEOs. That is, it provides an alternative test of Prediction 1.

We use a three-day event window around merger bids ( $-1$  to  $+1$ ), where day 0 is the day of the announcement.<sup>43</sup> Here we include all merger bids, both successful and unsuccessful, in the estimation. We calculate the cumulative abnormal return to the acquiring firm's stock over this window. We use market returns as our proxy for expected returns. This approach is appropriate since our sample consists of large U.S. companies that compose a substantial portion of market returns.<sup>44</sup> So, assuming that  $\alpha = 0$  and  $\beta = 1$  for the firms in our sample, abnormal returns are given by

$$AR_{it} = r_{it} - r_t^m,$$

where  $r_{it}$  is firm  $i$ 's return on day  $t$  of the event window and  $r_t^m$  is the return on the S&P 500 index that day. Cumulative abnormal returns are

$$CAR_i = \sum_{t=-1}^1 AR_{it}.$$

As shown in Panel A of Table 10, the average announcement effect is  $-42$  basis points in the overall sample. This number decomposes into a highly significant average abnormal return of  $-100$  bp for Longholder CEOs and an insignificant average of  $-27$  bp for the other CEOs. That is, the market reaction to merger bids by overconfident CEOs is almost four times as negative as for the rest of the sample.

We subdivide the sample of merger announcements further into cash bids (no equity financing) and stock bids (at least partial equity financing). We see that the insignificant average announcement effect for non-overconfident CEOs decomposes into a significantly positive reaction to cash bids and a significantly negative reaction to stock bids. Bids of Longholder CEOs, instead, always trigger a negative average reaction, though it is more than four times as large

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<sup>43</sup>We find similar results using a window of five days ( $-2$  to  $+2$ ).

<sup>44</sup>The standard market-model results (using a pre-estimation period to identify  $\alpha$  and  $\beta$ ) are almost identical.

and significant only for stock bids (−140 bp). Furthermore, we find that the negative reaction to bids of Longholder CEOs is most pronounced for the subsample of firm-years classified as Post-Longholder. Here, the average effect is −150 bp (and −240 bp for stock bids), and is again significant at 1 percent.

We find similar, but weaker results for our alternative measures of overconfidence. (Note that the press measure is not suitable since it applies only to the subsample of firms years up to the first merger.) Using Holder 67, the announcement effect for non-overconfident CEOs is −56 bp (insignificant) but significant at −67 bp for overconfident CEOs.

We then test whether the negative contribution of overconfidence to cumulative abnormal returns holds up controlling for firm and (other) CEO characteristics. We run the following cross-sectional regression:

$$CAR_i = \gamma_1 + \gamma_2 O_i + X_i'G + \varepsilon_i \quad (4)$$

where  $O$  indicates an overconfident manager and  $X$  is the set of controls. We control for the effects of stock and option ownership (incentives), relatedness of the acquisition (an indicator equal to 1 if the acquiror and target share the same Fama-French industry group), corporate governance (efficient board size), and cash financing. We also add year effects to control for time trends in the average market reaction to merger bids. The null hypothesis is  $\gamma_2 = 0$ . Panel B of Table 10 presents the results using the Longholder proxy.

The control variables in the regressions all have the expected signs. The two consistently significant controls are cash financing and vested options. Cash deals are, on average, viewed more favorably by the market. The effect of vested option holdings on cumulative abnormal returns is decidedly non-linear. The positive incentive effects of vested options appear maximal in the lower range of vested option holdings. A negative effect – perhaps due to entrenchment or other negative aspects of excessive CEO power – applies at very high values. We include a quadratic term to capture the non-linearity.

Most importantly, the market reaction to merger bids of Longholders is negative. Compared to the simple averages, the difference between Longholder CEOs and the remaining sample increases from −73 bp (Column 1, corresponding to −100 bp versus −27 bp in Panel A) to −102 bp. The significance of the difference increases as well, from a t-statistic of 1.96 to 2.57. Including year dummies (Column 3) to control for the possibility that Longholder and non-Longholder bids cluster in different (market-wide) merger waves yields virtually identical

results. Columns (4) and (5) reveal that the results are driven by Post-Longholder firm-years. The market strongly discounts the bids of overconfident CEOs only after they have revealed their overconfidence (at least partially) through their portfolio decisions. That is, only Post-Longholder has a significant negative impact on the cumulative abnormal returns to merger bids. Using Holder 67 as the overconfidence proxy yields directionally similar though weaker results. The negative impact of overconfidence on the cumulative abnormal returns to merger bids is significant at 10 percent only over a longer  $[-2,+2]$  event window.

We also add controls for CEO age and the consolidation of the titles CEO, Chairman of the Board, and President (untabulated). Both of these variables appear to negatively impact the cumulative abnormal return to merger bids, but are orthogonal to the overconfidence effect. Finally, we include the interaction of industry effects (48 Fama-French industry groups) and year effects as controls. This specification controls for industry-specific merger waves. Again, the overconfidence estimates are unaffected.

The results confirm that the outside market recognizes that overconfident CEOs destroy wealth of their shareholders by overbidding and engaging in bad deals. The announcement effect also provides an alternative measure of the amount of value destruction that can be attributed to overconfident CEOs. Our Longholder measure identifies 10.8 percent of CEOs as overconfident. If we calculate the value creation or destruction to acquiring-company shareholders as announcement effect times market capitalization before announcement, we find that this 10.8 percent of CEOs is responsible for 33.2 percent of value destruction around merger bids. Per bid, overconfident managers destroy on average \$5m more value than other CEOs. In aggregate, mergers of Longholder CEOs are responsible for the loss of \$2.321bn to acquiring shareholders (out of \$6.983bn total) during the sample period.

## VII Conclusion

This paper provides evidence that overconfidence induces mergers to the detriment of the acquiror's shareholders. Our theoretical framework clarifies that overconfident CEOs do not necessarily make more acquisitions – that depends on the trade-off between perceived undervaluation and overestimation of future returns. However, overconfident CEOs are unambiguously more likely to overpay, to undertake value-destroying acquisitions, and to make acquisitions when their firm has abundant internal resources.

Our empirical analysis confirms these predictions. We also find that overconfident CEOs are more acquisitive even unconditionally. To capture CEO overconfidence, we assume two perspectives. Our portfolio measures rely on CEOs' private investment decisions and their "revealed beliefs." Our press measure relies on the perception of CEOs by outsiders. The latter measure also serves as a check that the type of personality captured with the portfolio measures is aptly described as "overconfident." In addition, we provide evidence that the market penalizes overconfident CEOs for their merger bids: cumulative abnormal returns around overconfident bids are 70 to 100 basis points lower on average than for non-overconfident CEOs.

These results point to overconfidence as an important element of a unified theory of corporate mergers. Refining the overconfidence story beyond the hubris hypothesis generates several empirical predictions that hold in the data. Much of the existing evidence in favor of the hubris hypothesis comes from interpreting the average announcement effects to merger bids: shareholders of target companies seem to gain while acquiring shareholders lose. However, these aggregate effects are open to many interpretations. A key contribution of our analysis is to directly measure which CEOs are prone to overconfidence (or hubris) and to show that those CEOs, in particular, destroy value for their shareholders through acquisitions. This field evidence complements the vast experimental and psychological evidence on individual overconfidence.

Our results also have important implications for contracting practices and organizational design. Overconfidence provides an alternative interpretation of agency problems in firms and the origin of private benefits. Unlike CEOs with empire-building preferences, who consciously disregard shareholders' interests, overconfident CEOs believe they are maximizing value. Thus, standard incentives are unlikely to correct their suboptimal decisions. However, overconfident CEOs do respond to financing constraints. Overconfidence therefore further motivates the constraining role of capital structure. In addition, independent directors may need to play a more active role in project assessment and selection to counterbalance CEO overconfidence.

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**Figure 1**  
**Merger Frequency (I): Probability of completing a merger**

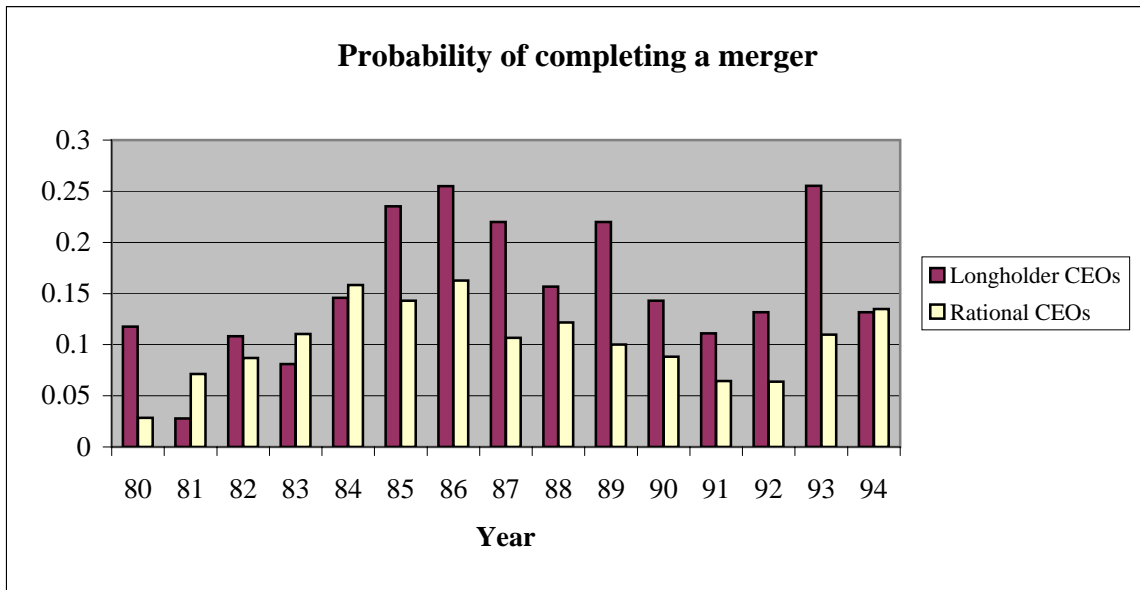


Figure 1 displays the year-by-year frequency of merger activities, separately for Longholder CEOs and the remaining sample of CEOs. For each subgroup, the frequency is calculated as the number of CEOs who did at least one merger divided by the total number of CEOs in that subgroup in a given year. Years are fiscal years.

**Figure 2**  
**Merger Frequency (II): Average number of merger**

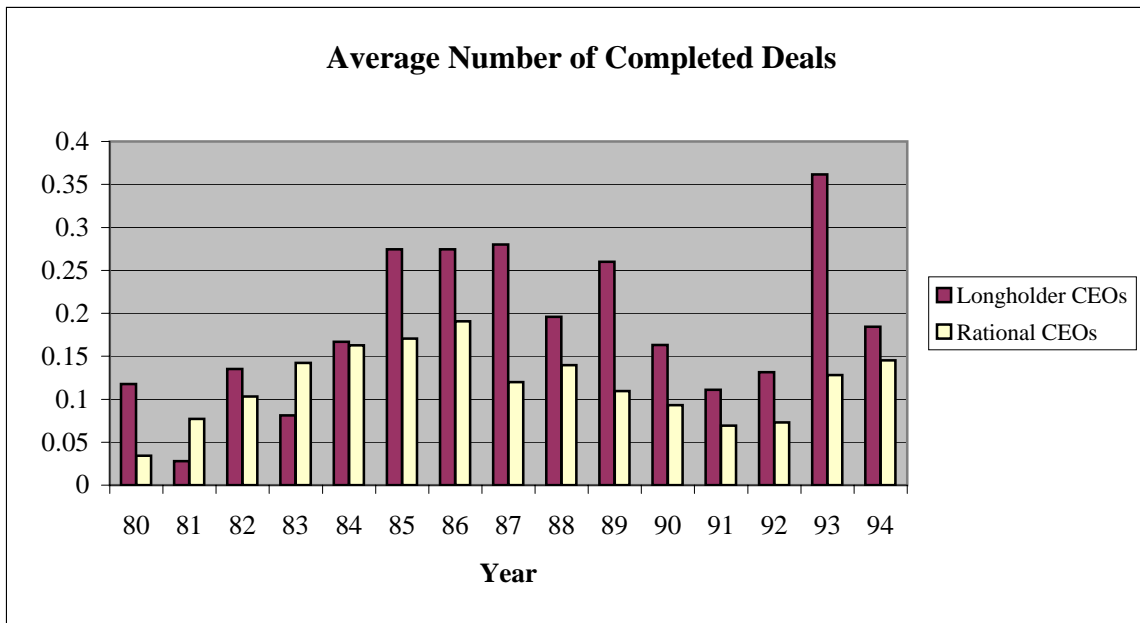


Figure 2 displays the year-by-year frequency of merger activities, separately for Longholder CEOs and the remaining sample of CEOs. For each subgroup, the frequency is calculated as the number mergers divided by the number of CEOs in that subgroup in a given year. Years are fiscal years.

**Table 1**  
**Summary Statistics**

Financial variables are reported in \$m. Q is the market value of assets over the book value of assets. Cash flow is earnings before extraordinary items plus depreciation. Stock ownership is the fraction of company stock owned by the CEO and his immediate family. Vested options are the CEO's holdings of options that are exercisable within 6 months, as a fraction of common shares outstanding. Vested Options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Corporate governance is a binary variable where 1 signifies that the board of directors has between four and twelve members. Technical Industry is binary and equal to 1 for firms with primary SIC codes 1000-1799, 8711; Financial Industry is equal to one for firms with primary SIC codes 6000-6799; Manufacturing Industry equals 1 for firms with primary SIC codes 2000-3999; Transportation Industry includes all firms with primary SIC codes 4000-4999; Trade Industry are SIC codes 5000-5999; and Service Industry are SIC codes 7000-8710, 8712-8720, 8722-8999. Assets, capital, Q, Stock Ownership, and Vested Options are measured at the beginning of the fiscal year; all other variables are at the end.

Finance education is binary and equal to 1 if the CEO had "financial education." Financial education includes undergraduate and graduate degrees in accounting, finance, business (incl. MBA), and economics. Technical education is binary and equals 1 if the CEO had "technical education." Technical education includes undergraduate and graduate degrees in engineering, physics, operations research, chemistry, mathematics, biology, pharmacy, and other applied sciences.

Press data comes from Business Week, The New York Times, Financial Times, The Economist and The Wall Street Journal using LexisNexis and Factiva.com. Relatedness is a dummy variable which takes the value 1 when the acquiror and target share the same Fama-French 48 industry group. Cumulative abnormal returns to the acquiror are calculated for an event window of -1 to +1 using a modified market model with the daily S&P 500 return as proxy for expected returns. The sample consists of 865 merger bids.

Panel A. Summary Statistics of Firm Data	Full Sample (394 firms)			
	Obs.	Mean	Median	St. Dev.
Assets	3911	5,979.06	2,248.15	13,985.26
Capital (PPE)	3911	2,278.64	877.20	5,587.07
Investment (CAPX)	3704	385.00	153.44	952.94
Cash Flow	3911	450.76	192.31	968.87
Cash Flow normalized by lagged capital (CF/k)	3911	0.37	0.26	0.36
Cash Flow normalized by lagged assets (CF/a)	3911	0.11	0.10	0.07
Q	3911	1.42	1.12	0.88
Corporate Governance	3911	0.55	1	0.50
Technical Industry	3894	0.04	0	0.19
Manufacturing Industry	3894	0.48	0	0.50
Transportation Industry	3894	0.24	0	0.43
Trade Industry	3894	0.10	0	0.31
Financial Industry	3894	0.09	0	0.29
Service Industry	3894	0.04	0	0.20

Panel B. Summary Statistics of CEO Data	Full Sample (738 CEOs)				Longholder CEOs (80 CEOs)			
	Obs.	Mean	Median	St. Dev.	Obs.	Mean	Median	St. Dev.
Age	3910	57.57	58	6.73	662	57.54	58	6.31
CEO Tenure	3873	8.50	6	7.39	639	10.68	9	7.07
President and Chairman	3911	0.38	0	0.48	662	0.36	0	0.48
Founder	3350	0.16	0	0.37	591	0.12	0	0.32
Stock Ownership	3911	0.02	0.001	0.07	662	0.02	0.003	0.04
Vested Options	3911	0.02	0.005	0.11	662	0.07	0.020	0.25
Finance Education	2302	0.34	0	0.47	422	0.42	0	0.49
Technical Education	2302	0.55	1	0.50	422	0.47	0	0.50

Panel C. Summary Statistics Press Data (393 firms; 738 CEOs)	Obs.	Mean	Median	St. Dev.
Total Mentions	3890	8.89	3	22.04
"Confident" Mentions	3889	0.08	0	0.34
"Optimistic" Mentions	3889	0.07	0	0.32
"Not Confident" Mentions	3889	0.003	0	0.07
"Not Optimistic" Mentions	3889	0.006	0	0.09
"Reliable, Cautious, Conservative, Practical, Steady, Frugal" Mentions	3884	0.05	0	0.27

Panel D. Summary Statistics of Merger Bids	Obs.	Mean	Median	St. Dev.
Relatedness	865	0.398	0	0.490
Cumulative abnormal return to acquiror [-1,+1]	865	-0.004	-0.007	0.048
Acquiror in Technical Industry	865	0.023	0	0.150
Acquiror in Manufacturing Industry	865	0.302	0	0.459
Acquiror in Transportation Industry	865	0.105	0	0.307
Acquiror in Trade Industry	865	0.073	0	0.260
Acquiror in Financial Industry	865	0.453	0	0.498
Acquiror in Service Industry	865	0.044	0	0.205

**Table 2**  
**Correlations of Portfolio Measures**

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. Size is the log of assets, Q the market value of assets over the book value of assets. Cash flow is earnings before extraordinary items plus depreciation, normalized by beginning-of-the-year capital. Stock Ownership is the fraction of company stock owned by the CEO and his immediate family. Vested Options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a fraction of common shares outstanding and multiplied by 10 so that the mean is comparable to Stock Ownership. Size, Q, Stock Ownership, and Vested Options are measured at the beginning of the year. Corporate governance is a binary variable equal to 1 if the board has between 4 and 12 directors.

Finance education is binary and equal to 1 if the CEO had "financial education." Financial education includes undergraduate and graduate degrees in accounting, finance, business (incl. MBA), and economics. Technical education is binary and equals 1 if the CEO had "technical education." Technical education includes undergraduate and graduate degrees in engineering, physics, operations research, chemistry, mathematics, biology, pharmacy, and other applied sciences.

**Panel A. Correlations with Firm Characteristics (N=3911)**

	Longholder	Size	Q	Cash Flow	Stock Ownership	Vested Options	Corporate Governance
Longholder	1						
Size	-0.09	1					
Q	0.09	-0.32	1				
Cash Flow	0.10	-0.13	0.39	1			
Stock Ownership	-0.04	-0.18	0.10	0.11	1		
Vested Options	0.19	-0.17	0.09	0.17	0.10	1	
Corporate Governance	0.04	-0.38	0.13	0.06	0.19	0.08	1

**Panel B. Correlations with CEO Characteristics (I) (N=3872)**

	Longholder	Age	Pres & Chm	Tenure
Longholder	1			
Age	0.00	1		
President and Chairman	-0.02	-0.03	1	
Tenure	0.13	0.40	0.004	1

**Panel C. Correlations with CEO Characteristics (II) (N=2078)**

	Longholder	Fin. Ed.	Tech. Ed.
Longholder	1		
Finance Education	0.08	1	
Technical Education	-0.07	-0.10	1

**Table 3**  
**Are Longholders Right to Hold Their Options?**

For each option that is held until expiration and that is at least 40% in the money at the beginning of its final year, we calculate the return the CEO would have gotten from instead exercising the option one year earlier and investing in the S&P 500. We assume exercise both in the final year and in the hypothetical year occur at the maximum stock price during that year.

<u>Percentile</u>	<u>Return</u>
10th	-0.24
20th	-0.15
30th	-0.10
40th	-0.05
50th	-0.03
60th	0.03
70th	0.10
80th	0.19
90th	0.39
Mean	0.03
Standard Deviation	0.27

**Table 4**

**Do Longholders Complete More Mergers?**

The dependent variable is binary where 1 signifies that the firm made at least one merger bid that was eventually successful in a particular firm year. Size is the log of assets at the beginning of the year. Q is the market value of assets over the book value of assets. Cash flow is earnings before extraordinary items plus depreciation and is normalized by capital at the beginning of the year. Stock ownership is the fraction of company stock owned by the CEO and his immediate family at the beginning of the year. Vested options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Corporate governance is a binary variable where 1 signifies that the board of directors has between four and twelve members.

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. 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 are all years classified as 1 under Longholder, but 0 under 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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in the logit and conditional logit regressions are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

**Panel A.**

	logit (1)	Random Effects logit (2)	Fixed Effects logit (3)	logit (4)	Random Effects logit (5)	Fixed Effects logit (6)	logit (7)	Random Effects logit (8)	Fixed Effects logit (9)
Size	0.946 (0.95)	0.9358 (1.03)	0.6537 (2.50)**	0.9428 (1.01)	0.9334 (1.06)	0.6600 (2.42)**	1.0153 (0.17)	0.9972 (0.03)	0.3278 (3.42)***
Q <sub>t-1</sub>	0.6476 (4.23)***	0.6225 (3.99)***	0.7135 (2.20)**	0.6465 (4.26)***	0.6222 (3.99)***	0.7154 (2.18)**	0.7104 (2.48)**	0.7041 (2.21)**	0.9062 (0.45)
Cash Flow	1.9143 (4.34)***	2.1949 (4.76)***	2.0231 (1.72)*	1.9196 (4.36)***	2.2002 (4.78)***	2.0377 (1.72)*	1.5318 (1.99)**	1.7618 (2.28)**	1.6607 (0.67)
Stock Ownership	1.4913 (0.50)	1.1862 (0.18)	0.384 (0.95)	1.4593 (0.47)	1.1626 (0.16)	0.3813 (0.96)	0.3185 (0.68)	0.4013 (0.53)	0.0418 (0.70)
Vested Options	1.5125 (2.42)**	1.0626 (0.15)	0.4566 (3.97)***	1.4798 (2.18)**	1.0413 (0.10)	0.4595 (3.93)***	3.2735 (1.19)	2.4788 (0.88)	0.6384 (0.51)
Corporate Governance	0.7569 (2.05)**	0.8105 (1.53)	1.0817 (0.40)	0.7592 (2.03)**	0.8123 (1.52)	1.0811 (0.40)	1.1266 (0.57)	1.1658 (0.75)	1.8488 (2.10)**
Longholder	1.658 (3.15)***	1.8292 (3.62)***	2.1891 (2.70)***						
Post-Longholder				1.4444 (1.76)*	1.538 (1.89)*	1.8642 (1.91)*			
Pre-Longholder				1.8259 (3.08)***	2.0581 (3.71)***	2.3305 (2.72)***			
Holder 67							1.5824 (2.51)**	1.8518 (3.04)***	2.5159 (2.49)**
Firm Fixed Effects	no	no	yes	no	no	yes	no	no	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	3911	3911	2568	3911	3911	2568	1667	1667	853
Number of Firms		394	225		394	225		301	124

Robust z statistics in parentheses. Constant included.

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

**Table 4 (Continued)**  
**Do Longholders Complete More Mergers?**

The dependent variable is binary where 1 signifies that the firm made at least one merger bid that was eventually successful in a particular firm year. Size is the log of assets at the beginning of the year. Q is the market value of assets over the book value of assets. Cash flow is earnings before extraordinary items plus depreciation and is normalized by capital at the beginning of the year. Stock ownership is the fraction of company stock owned by the CEO and his immediate family at the beginning of the year. Vested options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Corporate governance is a binary variable where 1 signifies that the board of directors has between four and twelve members. 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.

Longholder: Did OK is 1 for CEOs for whom Longholder is 1 and who did better by holding at least as many times as they would have done better by exercising longheld options a year earlier. Longholder: Should Have Exercised is 1 for CEOs for whom Longholder is 1 and who would have done better by exercising a year earlier more times than they did better by holding. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in columns 1 and 3 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

**Panel B. Do "Mistaken" Holders Drive the Acquisitiveness Result?**

	logit (1)	Random Effects logit (2)	Fixed Effects logit (3)
Size	0.9486 (0.88)	0.935 (1.02)	0.6757 (2.20)**
Q <sub>t-1</sub>	0.6313 (4.42)***	0.607 (4.07)***	0.7147 (2.14)**
Cash Flow	1.9368 (4.23)***	2.214 (4.64)***	2.052 (1.71)*
Stock Ownership	1.555 (0.54)	1.2547 (0.24)	0.3502 (0.97)
Vested Options	1.6809 (0.57)	0.8461 (0.16)	0.3026 (1.03)
Corporate Governance	0.7581 (2.01)**	0.8157 (1.47)	1.111 (0.54)
Longholder: Did OK	1.5567 (2.19)**	1.6346 (2.31)**	1.4259 (0.76)
Longholder: Should Have Exercised	1.7386 (2.50)**	1.9848 (2.99)***	3.4042 (3.47)***
Year Fixed Effects	yes	yes	yes
Observations	3857	3857	2515
Number of Firms		392	221

Robust z statistics in parentheses. Constant included.

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

**Table 5**  
**Diversifying and Same-Industry Mergers**

The dependent variable in panel 1 is binary where 1 signifies that the firm made a diversifying merger bid that was eventually successful in a particular firm year. The dependent variable in panel 2 is binary where 1 signifies that the firm made a within-industry merger bid that was eventually successful in a particular firm year. Industries are the 48 Fama and French industry groups (1997). Size is the log of assets at the beginning of the year. Q is the market value of assets over the book value of assets. Cash flow is earnings before extraordinary items plus depreciation and is normalized by capital at the beginning of the year. Stock ownership is the fraction of company stock owned by the CEO and his immediate family at the beginning of the year. Vested options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Corporate governance is a binary variable where 1 signifies that the board of directors has between four and twelve members.

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. 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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors of the logit and conditional logit estimations are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

	Panel 1. Diversifying Mergers			Panel 2. Within Industry Mergers		
	logit (1)	Random Effects logit (2)	Fixed Effects logit (3)	logit (4)	Random Effects logit (5)	Fixed Effects logit (6)
<i>A. Longholder</i>						
Size	1.047 (0.69)	1.0505 (0.61)	0.7592 (1.29)	0.8019 (2.61)***	0.773 (2.73)***	0.4656 (2.77)***
Q <sub>t-1</sub>	0.6355 (3.18)***	0.6393 (2.85)***	0.8437 (0.86)	0.66 (3.33)***	0.6073 (3.01)***	0.5359 (2.43)**
Cash Flow	1.7663 (3.35)***	2.0348 (3.53)***	2.1685 (1.53)	1.9448 (3.39)***	2.1876 (3.41)***	2.496 (1.50)
Stock Ownership	2.3805 (0.94)	1.5588 (0.38)	0.1268 (1.48)	0.8093 (0.17)	0.9514 (0.04)	0.8916 (0.10)
Vested Options	1.6635 (3.33)***	1.4561 (0.85)	0.8589 (0.50)	0.9352 (0.29)	0.5858 (0.88)	0.1853 (3.71)***
Corporate Governance	0.7172 (1.95)*	0.7642 (1.56)	0.9737 (0.11)	0.8131 (1.08)	0.8458 (0.86)	1.1113 (0.36)
Longholder	1.777 (3.14)***	1.9603 (3.30)***	2.5376 (3.31)***	1.3415 (1.26)	1.4388 (1.51)	1.6646 (1.03)
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Observations	3911	3911	1832	3911	3911	1467
Number of Firms		394	159		394	127
<i>B. Holder 67</i>						
Size	1.1046 (0.98)	1.1213 (0.98)	0.4081 (2.59)**	0.8974 (0.88)	0.8297 (1.31)	0.2705 (2.29)**
Q <sub>t-1</sub>	0.6811 (1.85)*	0.7134 (1.67)*	1.0131 (0.05)	0.7549 (1.79)*	0.7141 (1.50)	0.7468 (0.61)
Cash Flow	1.578 (1.91)*	1.7584 (1.94)*	1.0641 (0.08)	1.325 (0.95)	1.5104 (1.10)	3.9006 (1.13)
Stock Ownership	2.1697 (0.47)	2.9632 (0.60)	0.1468 (0.50)	0.0091 (1.99)**	0.0038 (1.51)	0 (2.19)**
Vested Options	4.8675 (1.30)	4.6032 (1.28)	1.8895 (0.43)	2.2121 (0.92)	1.1987 (0.11)	0.014 (1.81)*
Corporate Governance	1.096 (0.36)	1.1357 (0.50)	1.5248 (1.07)	1.0678 (0.24)	1.0294 (0.10)	2.0614 (1.51)
Holder 67	1.7711 (2.51)**	1.9383 (2.66)***	2.724 (2.12)**	1.0974 (0.36)	1.1867 (0.61)	0.8431 (0.34)
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Observations	1667	1667	569	1667	1667	471
Number of Firms		301	85		301	66

Robust z statistics in parentheses. Constant included.

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



**Table 6**  
**Financial Constraints**

The dependent variable is binary where 1 signifies that the firm made at least one merger bid that was eventually successful in a particular firm year. Industries are the 48 Fama and French industry groups (1997). Size is the log of assets at the beginning of the year. Q is the market value of assets over the book value of assets. Cash flow is earnings before extraordinary items plus depreciation and is normalized by capital at the beginning of the year. Stock ownership is the fraction of company stock owned by the CEO and his immediate family at the beginning of the year. Vested options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Corporate governance is a binary variable where 1 signifies that the board of directors has between four and twelve members.

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. Equity dependence is measured by quintiling the sample using the Kaplan-Zingales index at the beginning of the prior fiscal year. All regressions are logit with random effects. Coefficients are presented as odds ratios.

	Least Equity Dependent		----->			Most Equity Dependent
	Random Effects logit	Random Effects logit	Random Effects logit	Random Effects logit	Random Effects logit	
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Size	0.8721 (1.05)	1.1371 (1.00)	0.9434 (0.39)	0.7672 (1.43)	0.9828 (0.10)	
Q <sub>t-1</sub>	0.4601 (3.05)***	0.8058 (1.00)	0.62 (1.46)	0.6522 (1.28)	0.6072 (1.31)	
Cash Flow	0.9115 (0.27)	1.6897 (0.98)	8.0689 (2.61)***	3.973 (1.38)	5.6369 (2.35)**	
Stock Ownership	0.1046 (0.82)	0.2199 (0.59)	4.9239 (0.71)	3.1767 (0.38)	2.978 (0.74)	
Vested Options	1.0536 (0.06)	111.1586 (2.25)**	2.0983 (0.70)	0.7263 (0.11)	12.3633 (1.62)	
Corporate Governance	0.924 (0.24)	0.8296 (0.63)	0.447 (2.42)**	0.8871 (0.36)	0.9991 (0.00)	
Longholder	2.0289 (2.09)**	1.6269 (1.54)	1.6465 (1.40)	2.1899 (1.58)	1.0654 (0.15)	
Year Fixed Effects	yes	yes	yes	yes	yes	
Observations	731	733	708	735	665	
Number of Firms	121	157	172	167	149	

z statistics in parentheses. Constant included.

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

**Table 7**  
**Merger Financing**

The sample includes all merger bids that were eventually successful. The dependent variable is binary and equal to 1 if the merger was financed using only cash. Undervalued is a binary variable where 1 indicates that Q at the beginning of the year was less than or equal to industry Q. Industries are the 48 Fama-French industry groups. Q is the market value of assets over the book value of assets. Stock ownership is the fraction of company stock owned by the CEO and his immediate family at the beginning of the year. Vested options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership.

Merger size is the amount the acquiror paid for the target as a fraction of acquiror value (for SDC mergers, amount paid is the value of the transaction; for CRSP mergers, it is the market value of the target the day after the announcement. When both variables are present, we use the minimum). KZ Quintile 'x' is a dummy variable equal to 1 if the lagged value of the Kaplan-Zingales index for that firm year is in the 'x'th quintile.

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. Standard errors are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

**Panel A. All Mergers with Disclosed Method of Payment**

	Total Mergers	Cash	Debt OR Cash and Debt	Stock AND Cash and/or Debt	Stock	odds (cash v. stock)	odds (cash v. other)	odds ratio (v stock)	odds ratio (v other)
Overconfident CEOs (Longholder=1)	188	38.8%	6.9%	19.7%	34.6%	1.12	0.63	1.09	1.10
Non-overconfident CEOs (Longholder=0)	708	33.5%	8.3%	25.6%	32.6%	1.03	0.58		

**Panel B. Regressions**

	logit (1)	logit (2)	logit (3)	logit (4)	logit (5)
Undervalued		1.7215 (2.72)***	1.8457 (3.02)***	1.9274 (3.11)***	0.9073 (0.38)
Q <sub>t-1</sub>	0.8018 (1.28)		1.2618 (1.26)	1.0288 (0.14)	0.4706 (3.30)***
Stock Ownership	2.818 (0.87)		1.7263 (0.41)	1.6837 (0.42)	0.2223 (1.10)
Vested Options	0.3403 (1.54)		0.5818 (0.75)	0.4279 (1.21)	0.1464 (0.83)
Merger Size	0.9934 (0.58)		0.981 (1.37)	0.9927 (0.58)	0.9922 (0.76)
KZ Quintile 2					0.7824 (0.73)
KZ Quintile 3					0.6403 (1.22)
KZ Quintile 4					0.5282 (1.70)*
KZ Quintile 5					0.4041 (2.57)**
Longholder	1.2001 (0.77)	0.7423 (0.84)	0.7685 (0.76)	0.7766 (0.72)	0.6792 (0.97)
(Undervalued)*(Longholder)		2.3096 (2.09)**	2.2577 (2.06)**	1.9555 (1.71)*	3.1857 (2.61)***
Year Fixed Effects	yes	no	no	yes	yes
Observations	772	772	772	772	430

Robust z statistics in parentheses. Constant included.

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

**Table 8**  
**Correlations of Press Measure**

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. 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. 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 panel, 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.

Size is the natural logarithm of assets at the beginning of the year. Q is the market value of assets over the book value of assets at the beginning of the year. Cash flow is earnings before extraordinary items plus depreciation and is normalized by capital at the beginning of the year. CEO ownership is the fraction 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 fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Corporate governance is the number of directors who currently serve as CEOs of other companies.

Finance education is binary and equal to 1 if the CEO had "financial education." Financial education includes undergraduate and graduate degrees in accounting, finance, business (incl. MBA), and economics. Technical education is binary and equals 1 if the CEO had "technical education." Technical education includes undergraduate and graduate degrees in engineering, physics, operations research, chemistry, mathematics, biology, pharmacy, and other applied sciences.

**Panel A. Correlations with Longholder ( $N = 3328$ ) and Holder 67 ( $N = 1698$ )**

	Longholder	TOTconf.	TOTmen.	Holder 67	TOTconf.	TOTmen.
Longholder	1			Holder 67	1	
TOTALconfident	0.11	1		TOTALconfident	0.07	1
TOTALmentions	0.02	0.34	1	TOTALmentions	-0.01	0.30

**Panel B. Correlations with Firm Characteristics ( $N = 3328$ )**

	TOTAL- confident	TOTAL- mentions	Size	Q	Cash Flow	CEO Ownership	CEO Vested Options	Corporate Governance
TOTALconfident	1							
TOTALmentions	0.34	1						
Size	0.22	0.32	1					
Q	0.07	0.02	-0.32	1				
Cash Flow	0.01	0.05	-0.13	0.39	1			
CEO Ownership	0.06	0.09	-0.18	0.10	0.11	1		
CEO Vested Options	0.02	0.01	-0.17	0.09	0.17	0.10	1	
Corporate Governance	-0.08	-0.08	-0.38	0.13	0.06	0.19	0.08	1

**Panel C. Correlations with CEO Characteristics ( $N = 3293$ )**

	TOTconf.	TOTmen.	Age	Pres & Chm	Tenure
TOTALconfident	1				
TOTALmentions	0.34	1			
Age	0.02	0.12	1		
President and Chairman	0.04	0.01	-0.03	1	
Tenure	0.12	0.12	0.40	0.004	1

**Panel D. Correlations with CEO Education ( $N = 2017$ )**

	TOTconf.	TOTmen.	Finance	Technical
TOTALconfident	1			
TOTALmentions	0.34	1		
Finance Education	0.03	-0.02	1	
Technical Education	0.01	0.05	-0.10	1

**Table 9**  
**Press Coverage and Mergers**

The dependent variable is binary where 1 signifies that the firm made at least one merger bid that was eventually successful in a particular firm year and includes all mergers in columns (1) and (2), only diversifying mergers in columns (3) and (4), and only intra-industry mergers in columns (5) and (6). Acquisitions are classified as diversifying or intra-industry using the Fama-French 48 industries. Size is the log of assets at the beginning of the year. Q is the market value of assets over the book value of assets. Cash flow is earnings before extraordinary items plus depreciation and is normalized by capital at the beginning of the year. Stock ownership is the fraction of company stock owned by the CEO and his immediate family at the beginning of the year. Vested options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year, as a fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Corporate governance is a binary variable where 1 signifies that the board of directors has between four and twelve members.

CEO age and tenure are measured in years. CEO chairman & president is a dummy variable and is equal to 1 if the CEO is also chairman of the board and president of his company. Finance education is binary and equal to 1 if the CEO had "financial education." Financial education includes undergraduate and graduate degrees in accounting, finance, business (incl. MBA), and economics. Technical education is binary and equals 1 for CEOs with undergraduate or graduate degrees in engineering, physics, operations research, chemistry, mathematics, biology, pharmacy, or other applied sciences.

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", "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. The "No past merger" state dummies capture time in the initial state and run from "Second Year as CEO" to "Fourteenth Year as CEO." The sample is restricted to all firm years up to the first merger for a given CEO (and drops all firm years under that CEO after the first merger, if any). Standard errors are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

	All Mergers		Diversifying Mergers		Intra-Industry Mergers	
	(1)	(2)	(3)	(4)	(5)	(6)
Size	0.8963 (0.99)	0.8735 (0.88)	0.9466 (0.37)	0.8348 (0.84)	0.7794 (1.71)*	0.8987 (0.49)
Q <sub>t-1</sub>	0.6023 (2.19)**	0.7082 (1.15)	0.7001 (1.23)	0.7633 (0.62)	0.3904 (2.69)***	0.5345 (1.67)*
Cash Flow	1.7996 (2.28)**	1.5148 (1.19)	1.7226 (1.74)*	1.0589 (0.13)	2.2758 (2.26)**	3.1154 (2.28)**
Stock Ownership	3.4073 (1.09)	1.3247 (0.19)	7.7777 (1.59)	3.1627 (0.66)	0.7913 (0.14)	0.0785 (0.67)
Vested Options	6.8469 (0.97)	104.5772 (0.87)	25.7996 (0.72)	5,582.75 (1.69)*	0.1648 (0.42)	0.0008 (0.65)
Corporate Governance	0.8321 (0.81)	0.7446 (0.96)	0.8514 (0.53)	0.7282 (0.81)	0.7995 (0.77)	0.7413 (0.76)
CEO age		1.0041 (0.16)		1.0032 (0.11)		1.0151 (0.31)
CEO chairman & president		0.9344 (0.25)		0.7827 (0.73)		1.2809 (0.58)
Finance Education		1.5409 (1.56)		1.8864 (1.93)*		1.1035 (0.22)
Technical Education		0.9026 (0.37)		0.9142 (0.27)		1.0669 (0.14)
TOTALmentions	1.0009 (0.35)	1.0005 (0.16)	1.0017 (0.65)	1.0028 (0.91)	0.9987 (0.33)	0.9951 (0.89)
TOTALconfident	1.7364 (1.73)*	2.2275 (2.18)**	2.1689 (1.92)*	2.8304 (2.27)**	1.3121 (0.61)	1.497 (0.70)
"No past merger" state dummies	yes	yes	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Observations	1144	716	1144	716	1040	548

Robust z-statistics in parentheses. Constant excluded.

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

**Table 10**  
**Market Response**

The event window is the day before through the day after the announcement of the bid. The dependent variable in Panel B is the cumulative abnormal return on the bidder's stock from the day before the announcement of the bid through the day after. Cumulative abnormal returns are calculated by taking the daily return on the bidder's common equity and subtracting expected returns. Expected returns are the daily return on the S&P 500 index. Cash bids are financed with any combination of cash and debt. Stock bids are financed with any portion of equity. Stock ownership is the fraction of company stock owned by the CEO and his immediate family at the beginning of the year in which the bid occurs. Vested options are the CEO's holdings of options that are exercisable within 6 months of the beginning of the year of the bid, as a fraction of common shares outstanding. Vested options are multiplied by 10 so that the mean is roughly comparable to stock ownership. Relatedness is 1 for acquisitions in which the bidder and target firms are in the same industry. Cash financing is a binary variable where 1 indicates that the acquisition was financed using some combination of cash and debt.

Corporate governance is a binary variable where 1 signifies that the board of directors has between four and twelve members. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option 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 are all years classified as 1 under Longholder, but 0 under Post-Longholder. All standard errors in Panel B are clustered by event date to account for cross-sectional correlation of stock returns.

**Panel A.**

	Average CAR [-1,+1]		
	All Bids	Cash Bids	Stock Bids
Full Sample	-0.0042 (865; 2.62)***	0.0040 (368; 1.64)	-0.0104 (497; 4.89)***
Longholder = 0	-0.0027 (654; 1.42)	0.0064 (279; 2.11)**	-0.0094 (375; 3.95)***
Longholder = 1	-0.0100 (192; 3.11)***	-0.0041 (78; 1.12)	-0.0140 (114; 2.94)***
Pre-Longholder = 1	-0.0073 (127; 1.85)*	-0.0041 (49; 1.00)	-0.0094 (78; 1.58)
Post-Longholder = 1	-0.0152 (65; 2.78)***	-0.0041 (29; 0.58)	-0.0241 (36; 3.09)***

Number of observations and t-statistics in parentheses.

**Panel B.**

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)
Stock Ownership		0.0462 (1.45)	0.0492 (1.52)	0.0458 (1.44)	0.0492 (1.52)
Vested Options		0.103 (2.68)***	0.1035 (2.55)**	0.1039 (2.70)***	0.1031 (2.54)**
(Vested Options) <sup>2</sup>		-0.0318 (2.69)***	-0.0317 (2.54)**	-0.0324 (2.74)***	-0.0319 (2.56)**
Relatedness		0.0017 (0.51)	0.0018 (0.55)	0.0019 (0.58)	0.002 (0.60)
Corporate Governance		0.0043 (1.09)	0.0049 (1.22)	0.0044 (1.12)	0.005 (1.24)
Cash Financing		0.0131 (3.86)***	0.016 (4.39)***	0.0131 (3.88)***	0.016 (4.38)***
Longholder	-0.0073 (1.96)*	-0.0102 (2.57)**	-0.0101 (2.56)**		
Post-Longholder				-0.0166 (2.92)***	-0.0158 (2.68)***
Pre-Longholder				-0.0069 (1.49)	-0.0071 (1.57)
Year Fixed Effects	no	no	yes	no	yes
Observations	846	846	846	846	846

Absolute value of t statistics in parentheses. Constant included.

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