

Who Makes Acquisitions?

CEO Overconfidence and the Market's Reaction*

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Abstract

We analyze the impact of CEO overconfidence on mergers and acquisitions. Overconfident CEOs over-estimate their ability to generate returns, both in their current firm and in potential takeover targets. Thus, on the margin, they undertake mergers that destroy value. Overconfidence also implies that managers view their company as undervalued by outside investors. Therefore, the impact of overconfidence is strongest when CEOs can finance mergers internally. We test these predictions using the merger decisions of a sample of Forbes 500 companies between 1980 and 1994. We classify CEOs as overconfident when, in spite of their under-diversification, they hold company options until expiration. We find that such CEOs are more likely to conduct mergers on average and that this effect is due largely to diversifying mergers. As predicted, overconfidence has the largest effect in firms with the most cash and untapped debt capacity. In addition, we find that the market reacts negatively to takeover bids and that this effect is significantly stronger for overconfident managers.

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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, 1981¹

1 Introduction

Mergers and acquisitions are among the most significant and disruptive activities undertaken by large corporations. In 1998 alone there were 12,356 announced mergers involving U.S. targets worth a combined \$1.63 trillion (Rappaport and Sirower 1999). The staggering economic magnitude of these deals has inspired a myriad of research on their causes and consequences. Most theories of mergers and acquisitions lay out the efficiency gains and profits that motivate takeover activity, often focusing on specific epochs. Mergers in the 1920’s are popularly characterized as “mergers for oligopoly.” Mergers in the 1960’s are described as “diversification mergers,” undertaken to exploit the benefits of internal capital markets.² Mergers in the 1980’s might be called “mergers for market discipline,” as corporate raiders acquired and disassembled the conglomerates of the 60’s.³ And, finally, mergers in the 1990’s are characterized as mergers for consolidation due to deregulation.⁴

The results of the empirical literature on the overall return to mergers, however, are mixed, suggesting that mergers may have no value on average.⁵ Moreover, if there is any gain from a merger, almost all of it appears to accrue to target shareholders. There is a significant positive gain in target value upon the announcement of a bid,⁶ and a significant loss to the acquiror.⁷

¹Quote taken from Weston, Chung, and Siu (1998).

²Gort (1962); Rumelt (1974); Meeks (1977); Steiner (1975).

³Jensen (1986); Blair (1993); Bhagat, Shleifer, and Vishny (1990).

⁴Andrade, Mitchell, and Stafford (2001).

⁵Andrade, Mitchell, and Stafford (2001), suggests a small positive, but statistically insignificant combined abnormal return during the announcement period. Jensen and Ruback (1983) and Roll (1986) present surveys of many earlier studies.

⁶See, e.g. Bradley, Desai, and Kim (1983), Asquith (1983), and Andrade, Mitchell, and Stafford (2001).

⁷Some examples are Dodd (1980), Firth (1980), and Ruback and Mikkelsen (1984). On the other hand, Andrade, Mitchell, and Stafford (2001) find a negative, but insignificant effect and Asquith (1983) finds no significant pattern.

These findings suggest that mergers are often not in the interest of the shareholders of the acquiring company.

In this paper, we argue that overconfidence can drive the acquiror’s decision to merge. Overconfident CEOs over-estimate their ability to generate returns, both in their current firm and in potential takeover targets. Thus, on the margin, they undertake mergers their rational counterparts would not. The overconfidence hypothesis proposes that deviations from rationality are an important building-block of a unified model of merger activity. While previous work by Shleifer and Vishny (2002) has focused on market irrationality, we study the implications of irrational decision-makers inside the firm.⁸

The idea that mergers may be driven by biases of the acquiring manager has long had popular appeal, as evidenced by our introductory quote. In the finance literature, Roll (1986) first introduced the “hubris hypothesis” of corporate takeovers. He interprets the evidence on the returns to mergers and their allocation between the acquiring and target firms as the result of overbidding.⁹

We build upon Roll’s pioneering work and analyze the impact of “hubris” or overconfidence on mergers and acquisitions. First, we construct a simple model of the merger decision for CEOs who are overconfident in their own abilities. Overconfident CEOs are likely to overvalue the acquisition of a target company because they overestimate the returns they can generate in the combined firm. They are also likely to overvalue their contribution to their own company. Thus, overconfidence implies that managers view their company as undervalued by outside investors who are less optimistic about the prospects of the firm. While this trade-off leaves the question of whether overconfident CEOs are more likely to conduct mergers on average an empirical matter, the model does make three clear predictions. First, overconfident managers are more likely to conduct mergers when they have access to sufficient sources of internal finance. In this case, they avoid the perceived loss in value from issuing undervalued equity to finance the merger. Second, overconfident managers are more likely to conduct “bad” mergers, i.e. mergers that either have no value or destroy value for the acquiring firm’s shareholders. And, third, the announcement effect will be lower for overconfident managers, on average, than for rational managers, since overconfident CEOs are more likely to make value-destroying bids.

The second step of our analysis is to test these predictions empirically. As in Malmendier

⁸Our paper is part of a growing literature, including Malmendier and Tate (2001), Bertrand and Schoar (2001), Heaton (2002), and Bertrand and Mullainathan (*forthcoming*), showing the importance of systematic biases and personality features of the decision-maker within the firm to corporate outcomes.

⁹Hayward and Hambrick (1997) and Hietala, Kaplan, and Robinson (2002) also relate acquisitiveness to CEO hubris.

and Tate (2001), we exploit time series data on the CEOs' holdings of company stock options to construct a measure of managerial overconfidence. Previous literature in corporate finance suggests that risk averse CEOs should exercise stock options well before expiration due to the suboptimal concentration of their portfolio in company-specific risk.¹⁰ Thus, we classify CEOs as overconfident when they display the opposite behavior, i.e. if they hold company stock options until the last year before expiration. This behavior suggests that the CEO is persistently bullish about his company's future prospects.

Then, given this classification of CEOs as either overconfident or rational, we explore the differences in observed merger activity between groups. Using merger data from CRSP and SDC, we find that overconfident CEOs are more likely to conduct a merger at any point in time than rational CEOs. We find that these results hold even when we control for firm fixed effects. That is, we find that overconfidence has a positive impact on managerial acquisitiveness even when we identify the effect using only the difference in acquisitiveness between overconfident and rational CEOs within the same firm. Thus, our results are robust to alternative interpretations that rely on cross-sectional variation among firms.

Of course, differences in information over time might account for these observed differences in managerial behavior, even within a firm. Specifically, a manager who has positive private information about a potential merger may find it profitable not only to merge, but also to hold his options in anticipation of the merger's returns. To address this possibility, we calculate the hypothetical returns to the CEO from exercising his options earlier, rather than holding to expiration. We find that these gains are positive, on average. Moreover, we find that such CEOs are no more likely to conduct mergers during the years in which they could have exercised options (that they instead hold to expiration) than in the remainder of their years as CEO. The uniform distribution of overconfident managers' acquisitions over their tenures suggests that the effect of overconfidence is a true managerial fixed effect. Overall, the higher acquisitiveness of overconfident CEOs even "on average" suggests that overconfidence is an important determinant of merger activities.

We also find evidence to support the specific empirical predictions of our model. First, we find that the relationship between overconfidence and the likelihood of doing a merger is strongest within the least equity dependent firms. Moreover, overconfident CEOs strongly prefer cash- or debt-financed mergers to stock deals, unless their firm appears to be overvalued by the market. Second, we find that the bulk of the effect of overconfidence on merger activity comes from an increased likelihood of conducting diversifying acquisitions. The empirical evidence from previous literature on the "diversification discount" suggests that the drawbacks

¹⁰See e.g. Carpenter (1998) and Hall and Murphy (2002).

to diversification, e.g. influence costs (Milgrom 1988, Meyer, Milgrom and Roberts 1992) and increased layers of agency costs (Scharfstein and Stein 2000), outweigh the potential benefits of a larger internal capital market (Gertner, Scharfstein, and Stein 1994, Stein 1997). Indeed, a host of papers show that diversified firms trade at a discount relative to stand alone entities in the same line of business.¹¹ Thus, ex ante, diversifying mergers seem less likely to create value in the acquiring firm. And, it is consistent with our theory that overconfident managers are particularly likely to undertake them.

Finally, we explore the market’s reaction to merger announcements. Using standard event study methodology, we show that outside investors react more negatively to the announcement of a bid by an overconfident CEO than by a rational CEO. This result holds even controlling for relatedness of the target and acquiror, ownership stake of the acquiring CEO, corporate governance of the acquiror, and method of financing the merger. So, even if overconfident CEOs create firm value along some dimensions¹², our results suggest that mergers and acquisitions are not among them.

Our theory of managerial overconfidence provides a natural complement to standard agency theory¹³. Both overconfidence and “empire-building” preferences¹⁴ predict heightened managerial acquisitiveness – especially given abundant internal resources – and a heightened sensitivity of corporate investment to cash flow. An overconfident CEO, however, believes that he is acting in the interest of the shareholders. Thus, overconfidence, cast as an agency problem, is likely to be unresponsive to traditional incentive-based remedies, like large equity stakes. And, as a result, it provides additional underpinning for models of debt overhang¹⁵. Unlike ownership, high leverage may effectively counterbalance an overconfident CEO’s eagerness to invest and acquire, given his reluctance to issue equity he perceives as undervalued. In addition, the failure of traditional incentives to mitigate overconfidence underscores the importance of an independent board of directors.

The paper is organized as follows. In Section 2 we present a simple model of managerial overconfidence. Overconfidence leads to increased acquisitiveness, particularly when internal

¹¹See, e.g., Lamont and Polk (2002), Servaes (1996), Berger and Ofek (1995), Lang and Stulz (1994). In addition, Morck, Shleifer and Vishny (1990) document a negative market reaction when a firm announces a diversifying deal.

¹²Van den Steen (2001), e.g., suggests that an overconfident CEO may be better at articulating a vision for the firm and then rallying the employees behind it. Bernardo and Welch (2001) and Goel and Thakor (2000) also explore the positive effects of overconfidence.

¹³Stein (*forthcoming*) provides a similar interpretation of managerial overconfidence.

¹⁴See, e.g., Baumol (1959), Marris (1964), Williamson (1964), Donaldson (1984) and Jensen (1986, 1993).

¹⁵See, e.g. Myers (1977), Grossman and Hart (1982) and Hart and Moore (1995).

finance is readily available or the merger is unlikely, *ex ante*, to create value. In Section 3 we introduce the data used in our analysis. Section 4 describes our empirical strategy and provides evidence that overconfidence can explain managerial acquisitiveness. We also discuss alternative explanations of our findings and explore the robustness of our results to changes in the empirical specification. Further, we provide evidence that CEO overconfidence matters more in firms with the most cash and untapped debt capacity. In Section 5, we study the market reaction to mergers by overconfident and rational CEOs. Section 6 briefly ties the evidence on overconfidence and corporate investment into the evidence on mergers and acquisitions. Finally, section 7 concludes and provides some broad directions for future research.

2 Theory

2.1 Setting and Psychological Foundations

We construct a simple model that demonstrates the effect of managerial overconfidence on merger decisions in an otherwise frictionless market. More specifically, we assume symmetric information about the quality of the deal and the value of the companies involved between corporate insiders and outside investors. We also assume that management acts in the interests of current shareholders.¹⁶ Thus, the model demonstrates the harmful effects of overconfidence on merger decisions even without moral hazard or adverse selection. In our empirical work, however, we account for these additional frictions.

We first consider the case of limited debt capacity.¹⁷ A firm with scarce cash reserves and high leverage must issue equity in order to finance a sufficiently costly acquisition. We will show later that the introduction of additional internal funds and untapped debt capacity only increases the incentives of overconfident managers to conduct acquisitions.

The key assumption of our model is that certain managers display overconfidence in their own abilities. This assumption rests on two branches of the psychology literature. The literature

¹⁶A manager who is not self-interested does not necessarily act in the interest of current shareholders. Rather than maximizing shareholder value, the manager might always choose the efficient action and maximize total shareholder wealth. In the context of a merger, a non-self-interested CEO would then maximize the combined value of the acquiring and the target firm (see Hart, 1993 and 2002). Note, though, that in the case of overconfident managers it is not clear whether (perceived) value maximization leads to more efficient outcomes than the maximization of current shareholder value. Indeed, the managers and shareholders will not agree on the value-maximizing course of action even without managerial self-interest.

¹⁷Limited debt-capacity can be endogenized in a model with bankruptcy costs (such as difficulty in accessing future financing); cf. Bolton and Scharfstein, 1990.

on self-enhancement documents that individuals tend to overestimate their abilities when comparing themselves to an anonymous benchmark or to their peers (Weinstein and Klein, 2002; Larwood and Whittaker, 1977; Svenson, 1981; Alicke, 1985; Alicke et al 1995). The “better than average effect” also affects the attribution of causality. Because individuals expect their behavior to produce success, they are more likely to attribute outcomes to their actions (and not to luck) when they succeed than when they fail.¹⁸ This self-serving attribution of outcomes, in turn, reinforces individual overconfidence.¹⁹

In addition, overconfidence increases through interaction with the self-enhancement effect. Individuals are likely to be overconfident about events that have a positive meaning and representation to them (Weinstein and Klein, 2002 and Weinstein 1980). In particular, individuals are more overconfident about outcomes that they believe are under their control (Weinstein, 1980). A CEO who conducts a merger is ostensibly replacing the current management of the target firm with himself. Therefore, he is likely to feel the illusion of control over the outcome and to underestimate the likelihood of eventual failure (March and Shapira 1987; Langer, 1975). Second, individuals are especially overconfident about outcomes to which they are highly committed (Weinstein, 1980). A successful merger substantially enhances both the CEO’s current professional standing and his future employment prospects. In addition, the typical compensation contract of a CEO ties his personal wealth to the company’s stock price and, hence, to the outcomes of his acquisition decisions. Of course, the effects of control and commitment attach to the CEO’s internal investment decisions as well. In the mergers and acquisition setting, this overconfidence about his own firm’s prospects may cause the CEO to be reluctant to raise external capital to finance a takeover bid.

Indeed, psychologists have found that executives are particularly prone to display overconfi-

¹⁸Miller and Ross (1975) provide a critical review of the abundant psychology literature on self-serving biases. More recently, Babcock and Loewenstein (1997) relate the “above average” effect to the literature on self-serving biases and analyze the effects on bargaining. Gervais and Odean (2001) apply self-serving attribution to trading behavior.

¹⁹Upward 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 driving skill) from the general overestimation of exogenous outcomes (such as the outbreak of a war), as in Bazerman (2002). The use of “confidence” for skill-related outcomes and “optimism” for exogenous outcomes is frequent in the literature on self-serving biases and the illusion of control; see Feather and Simon (1971) and Langer (1975). Overoptimism refers to exogenous events, for instance, in Hey (1984) and Milburn (1978).

Another form of overconfidence is analyzed in the so-called calibration literature. This literature shows that individuals also tend to overestimate the accuracy of their beliefs (Alpert and Raiffa, 1982; Fischhoff, Slovic, and Lichtenstein, 1977). In this paper, we focus on overconfidence with respect to first moments rather than second moments.

dence, both in terms of the “better-than-average effect” and in terms of “narrow confidence intervals” (Larwood and Whittaker, 1977; Kidd, 1970; Moore, 1977; Kahneman and Lovallo, 1993). Baron (2000) surveys related literature on “cognitive factors in entrepreneurship,” noting prominently the tendency of entrepreneurs to be overconfident in their own judgements. Finally, Camerer and Lovallo (1999) provide a controlled economic experiment in which subjects display overconfidence in a market entry game.

In our theoretical framework, overconfidence manifests itself in two forms. First, the manager may overestimate the value of the potential merger. This overvaluation stems from the manager’s belief that his leadership skills are “better than average” (and, by implication, better than the target’s current management) or from an underestimation of the downside to the merger due to the “illusion of control” over its outcome. Second, the manager may overestimate the value of his current company. That is, the manager may believe that his company’s equity is undervalued by the market. This overvaluation stems from the overestimation of future returns from “hand-picked” investment projects or general overestimation of the capitalized value of his future leadership.

The basic notation of the model is as follows. There are two companies, Acquiror A and Target T , which have market values of V_A and V_T respectively. The manager of A chooses whether or not to acquire T . We denote by c the amount of cash manager A uses as part of the financing of the merger. $V(c)$ is the market value of the combination of A and T , $\widehat{V}(c)$ 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. For ease of notation, we refer to $V(c)$ and $\widehat{V}(c)$ as simply V and \widehat{V} for the remainder of the analysis.

We call a CEO overconfident when $\widehat{V}_A > V_A$ and $\widehat{V} - V > \widehat{V}_A - V_A$.²⁰ The first condition is that the CEO believes the market undervalues his leadership in his own company. The second condition is that the CEO overvalues the merger itself. Specifically, he overestimates either the positive impact his leadership will have on the value of the target’s assets or the synergies of the two companies’ operations.

2.2 Acquisition Decision of a Rational CEO

We first consider the case in which there are no competing bidders. Then, the potential acquiror must pay V_T for the target. Since the capital market is fully efficient, there is no extra cost

²⁰In the next section we will show that $\widehat{V} - V$ is independent of c in our model. See footnote 21 for a discussion of the assumptions underlying this result and the implications of relaxing them.

of raising external capital to finance the merger. So, consider the rational CEO's decision to make a bid. Target management and shareholders, like the A manager, believe the merged company will be worth V . Thus, if the A manager offers them an amount $c < V_T$ of cash financing (or other non-diluting assets), they also demand a share s of the merged company such that $sV = V_T - c$. So, to conduct the merger, the acquiring CEO will have to sell $\frac{V_T - c}{V}$ of the company to new shareholders. Since he acts in the interest of current shareholders, he chooses to conduct the takeover if and only if $(1 - s)V > V_A$ or $V - (V_T - c) > V_A$.

We can decompose V as follows:

$$V = V_A + V_T + e - c$$

where $e \in \mathbb{R}$ is the value of the synergies between the two companies that will accrue if they merge. Then, substituting e into the decision rule, we find that the manager decides to "acquire whenever $e > 0$." Not surprisingly, the rational CEO makes the first best acquisition decision.

The post-acquisition value of the firm to current shareholders is $\bar{V}(c) = V - (V_T - c) = V_A + e$. So, as expected, $\frac{\partial \bar{V}}{\partial c} = 0$. That is, the rational acquiror is indifferent among financing the merger with cash, equity, or a combination of the two.

2.3 Acquisition Decision of an Overconfident CEO

An overconfident CEO overestimates both the value of his own company and the value of the merged firm. In terms of our model, overconfidence implies $\hat{V}_A > V_A$ and $\hat{V} - V > \hat{V}_A - V_A$. As a result, the value of a merger to an overconfident manager depends on the means of financing. In particular, an overconfident manager perceives a cost to financing the potential merger with undervalued shares.

More explicitly, suppose the manager uses c in cash (or other non-diluting assets) to finance the deal. Then, maintaining our assumptions of no competition, he must finance $V_T - c$ using equity. Since the target's management and shareholders, like the market, believe that the merged company will be worth V , after cash outflow c , they demand a share s of the merged company such that $sV = V_T - c$. To conduct the merger with an amount of cash financing c , the manager of company A has to sell $\frac{V_T - c}{V}$ of the company to the target shareholders. Whenever $\hat{V} > V$, he believes that issuing new equity entails a loss to current shareholders of $\left[\frac{V_T - c}{V} - \frac{V_T - c}{\hat{V}} \right] \hat{V} = \frac{(\hat{V} - V)(V_T - c)}{V}$.

An overconfident manager undertakes the merger despite this cost if the value of the diluted shares in the merged company to A 's current shareholders is greater than the value of A

forsaking the merger. That is, he undertakes the merger if and only if $(1-s)\widehat{V} > \widehat{V}_A$ for some c . Substituting for s , this expression becomes $\frac{V-V_T+c}{V}\widehat{V} > \widehat{V}_A$. Equivalently, he acquires T if $\widehat{V} - (V_T - c) - \left[\frac{(\widehat{V}-V)(V_T-c)}{V} \right] > \widehat{V}_A$. That is, the manager's perceived valuation of the merged company minus what he must give to target shareholders minus the loss due to dilution must exceed his perceived value of A without the merger.

As we did for the rational CEO, we can rewrite the condition for making a bid by decomposing \widehat{V} . Specifically, we write

$$\widehat{V} = \widehat{V}_A + V_T + e + \widehat{e} - c$$

where $\widehat{e} \in R_{++}$ are the additional merger synergies the manager of company A perceives from his leadership.²¹ Then, the overconfident manager's decision rule can be expressed as "merge whenever $e + \widehat{e} > \left[\frac{(\widehat{V}-V)(V_T-c)}{V} \right]$." That is, merge whenever total perceived merger synergies exceed the perceived loss due to dilution.

Finally, we can write

$$V = V_A + V_T + e - c$$

so that the decision rule becomes "merge whenever $e + \widehat{e} > \left[\frac{(\widehat{V}_A - V_A + \widehat{e})(V_T - c)}{V} \right]$." This reformulation allows us to disentangle the effects of perceived own company undervaluation ($\widehat{V}_A - V_A$) on \widehat{V} from the effects of perceived additional synergies from the merger (\widehat{e}).

Then, combining these results with the results of the prior section yields the following propositions.

Proposition 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 of the firm to current shareholders as $\widehat{V}(c) = \frac{V-V_T+c}{V}\widehat{V}$. Substituting for \widehat{V} and V , we have $\widehat{V} = \frac{(V_A+e)(\widehat{V}_A+V_T+e+\widehat{e}-c)}{V_A+V_T+e-c}$. Then $\frac{\partial \widehat{V}}{\partial c} = \frac{(V_A+e)(\widehat{V}_A-V_A)}{V^2}$. So, as $\widehat{V}_A > V_A$ by assumption (i.e., the overconfident CEO perceives his company as undervalued), $\frac{\partial \widehat{V}}{\partial c} > 0$ and post-merger value is maximized on $c \in [0, V_T]$ by setting c as high as possible. **Q.E.D.**

²¹More 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. Here we use the simplifying assumption $\widehat{e}(c) = \widehat{e} \forall c$. However, the exact functional form of $\widehat{e}(c)$ is not central to our results. If $\widehat{e}(c)$ decreases in c , then the negative marginal value of increased cash financing may counterbalance the undervaluation effect (to some degree). As long as $\widehat{e}(\cdot) > 0$, though, the main results of the section go through.

Proposition 2 *A rational CEO never conducts a value-destroying merger. An overconfident CEO, however, conducts value-destroying acquisitions if the perceived synergies \hat{e} are sufficiently large and if the perceived undervaluation $\hat{V}_A - V_A$ and the portion of the deal financed by equity $\frac{V_T - c}{V}$ are sufficiently small.*

Proof: Mergers create value if and only if $e > 0$. Thus, the claim that a rational CEO does not conduct a value-destroying merger follows directly from his decision rule (see Section 2.2). In Section 2.3, we showed that an overconfident CEO conducts a merger whenever $e + \hat{e} > \left[\frac{(\hat{V}_A - V_A + \hat{e})(V_T - c)}{V} \right]$. Note that $\hat{e} > 0$ by assumption. Thus, if $e \leq 0$, he still conducts the merger as long as $\hat{e} > |e|$ and $\hat{V}_A - V_A$ and $\frac{V_T - c}{V}$ are sufficiently small. **Q.E.D.**

Proposition 3 *Consider a company with internal resources valuing at least V_T . Then, a rational CEO conducts a merger only if an overconfident CEO would conduct the merger as well. An overconfident CEO will conduct some value-destroying mergers that a rational CEO would not.*

Proof: In Section 2.3, we show that an overconfident CEO conducts a merger whenever $e + \hat{e} > \left[\frac{(\hat{V}_A - V_A + \hat{e})(V_T - c)}{V} \right]$. Since the overconfident manager has internal resources in excess of V_T , he will set $c = V_T$ by Proposition 1, and the condition for conducting the merger becomes $e + \hat{e} > 0$. Since the rational CEO merges whenever $e > 0$ (see Section 2.2) and $\hat{e} > 0$, the first part of Proposition 3 follows. The last statement of the proposition follows directly from Proposition 2. **Q.E.D.**

Proposition 4 *Consider a company with internal resources valuing less than V_T . Then, an overconfident CEO does some value-destroying mergers that a rational CEO would not. Similarly, a rational CEO does some value-creating mergers that the overconfident CEO would not.*

Proof: The first statement follows from Proposition 2. To show the second statement, suppose $e > 0$. Then, the rational CEO always does the merger (see Section 2.2). From Section 2.3, the overconfident CEO will do the merger if and only if $e + \hat{e} > \left[\frac{(\hat{V}_A - V_A + \hat{e})(V_T - c)}{V} \right]$. So, if \hat{e} is sufficiently small and $\hat{V}_A - V_A$ or $\frac{V_T - c}{V}$ is sufficiently large, the overconfident CEO will not do the merger. **Q.E.D.**

Before turning to the empirical predictions of our model, we consider three important generalizations of the basic framework.

2.4 Extensions

2.4.1 Competing Bidders

Suppose that there are two companies competing for control of T , denoted A_i , $i = 1, 2$, and that bidders compete in an English auction. Denote by W_i the A_i manager's maximal willingness to pay for T and let \bar{c}_i be the value of company A_i 's internal resources. Since W_i is simply the market value of the target plus the (perceived) surplus to the acquiring company's current shareholders as a result of the merger, we can quantify W_i for the cases of a rational and overconfident manager as follows:

1. $W_i = V_T + e_i$ if the manager of company A_i is rational.
2. $W_i = V_T + e_i + \hat{e}_i - \left[\frac{(\hat{V}_{A_i} - V_{A_i} + \hat{e}_i)(W_i - \bar{c}_i)}{V_{A_i} + V_T + e_i - \bar{c}_i} \right] = \frac{(V_{A_i} + V_T + e_i - \bar{c}_i)(V_T + e_i + \hat{e}_i) + \bar{c}_i(\hat{V}_{A_i} - V_{A_i} + \hat{e}_i)}{\hat{V}_{A_i} + V_T + e_i + \hat{e}_i - \bar{c}_i}$ if manager A_i is overconfident. Note that the overconfident CEO exhausts his internal resources to finance the merger (see Proposition 1).²²

Then, the equilibrium outcome is the following:²³

For $\min W_i > V_T$,

1. the winning bidder is given by $\arg \max_i W_i$;
2. the winning bid is $\min_i W_i$.

Not surprisingly, competition (weakly) improves the situation of target shareholders regardless of the rationality of the two bidders. Note that competition may lead an overconfident manager to overpay for the target. For instance, suppose the overconfident manager of company A_1 wins the auction. Then, he will overpay if $W_2 \in (V_T + e_1, W_1)$. Indeed, the threat of entry by A_2 may be sufficient to induce overpayment.

It is also worth noting that an overconfident bidder does not always bid higher than a rational bidder, even if the actual synergies of the merger are the same for both bidders ($e_1 = e_2$). In

²² W_i simplifies to $V_T + e_i + \hat{e}_i$ if the manager has sufficient internal resources to pay for the merger ($\bar{c}_i \geq W_i$).

²³We ignore the knife-edge case of a tie.

particular, an overconfident bidder who is considerably more overconfident about the value of his own company (\widehat{V}_{A_i}) than about the merger (\widehat{e}_i) may lose the takeover contest.

2.4.2 Investment

Another interesting extension of the model is the inclusion of internal investment projects. For a rational CEO, of course, the possibility of investing internally is irrelevant; he does any project, external or internal, which has a positive net present value. For the overconfident CEO, however, the issue is potentially important, as he must allocate resources among projects in a way that maximizes returns while minimizing perceived financing costs.²⁴

An extended model of corporate decision-making would include the menus of both potential acquisitions and internal projects. When new resources become available to the CEO, either as a cash windfall or through the relaxation of perceived financing constraints, the CEO initiates the next project on either or both menus. While relative returns will determine which project he chooses first, for a sufficient influx of resources, we expect the CEO to increase the number of projects of both types.

We will examine the trade-off between investment and mergers in more detail in the empirical section of the paper.

2.4.3 Overconfident Target Management

Managerial overconfidence on the side of the target firm does not affect the main predictions of our model. There are, however, interesting comparative statics that arise due to overconfidence of the target manager. For example, acquisitions of target firms with overconfident management are more likely to be hostile takeovers. The overconfident target management might believe they can create at least as much value as the potential acquirors and, hence, view all but the most lucrative bids as too low. Similarly, we would expect acquirors to pay a higher premium for targets with overconfident managers in friendly deals. As a result, the acquirors of firms with overconfident managers are likely to be among the most overconfident managers. In both cases, overconfidence on the side of the target management can be beneficial

²⁴Note that another potential use of internal resources is to repurchase shares the overconfident CEO perceives to be undervalued. However, our assumption that the CEO maximizes *current* shareholder value effectively eliminates this possibility. Since any gain to remaining shareholders by repurchasing undervalued shares must be offset by a loss to the former shareholders (it is a zero-sum game), the CEO will not wish to undertake such a transaction.

to the target shareholders.²⁵ Unfortunately, we cannot test any of these implications due to data limitations.²⁶

2.5 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 on average.

The first quantity of interest is the difference in the average probability of conducting a merger for overconfident and rational CEOs. As noted above, the overconfidence hypothesis does not imply an unambiguous prediction about this quantity. However, higher average acquisitiveness of overconfident managers would indicate the importance of overconfidence as a general explanation of observed merger activity. It would also indicate that financing constraints, on average, do not bind.

The model does deliver the following three testable predictions. Our first prediction follows from Proposition 2.

Prediction 1. Overconfident CEOs are more likely to conduct mergers that ex ante have a high probability of failure (and negative expected return).

Similarly, Proposition 3 immediately implies the following:

Prediction 2. An overconfident CEO with abundant internal resources (e.g. large cash reserves and low leverage) is more likely to conduct an acquisition than a rational CEO.

Finally, Proposition 2 and Proposition 4 together imply that mergers conducted by overconfident CEOs will be worse on average than mergers conducted by rational CEOs. From Proposition 4, we see that any value-creating merger ($e > 0$) undertaken by an overconfident

²⁵The argument that overconfidence can be beneficial is more general, see Schelling (1960).

²⁶Specifically, the data on personal portfolio decisions that we use to construct a proxy of overconfidence is only available for 477 firms. Tests requiring a measure of overconfidence for both the acquiring and the target manager would limit the analysis to the very few cases in which one of these 477 firms acquired another one of the 477.

CEO will also be undertaken by a rational CEO. However, Proposition 2 and Proposition 4 tell us that the overconfident CEO will forego some mergers with positive value and do others with negative value. In addition, we have maintained the assumption that the market is fully rational. So, all information about the quality of the deal will be incorporated at the announcement date and we have the following prediction:

Prediction 3. The difference between the average stock price reaction to the announcement of a merger bid by an overconfident CEO and the average stock price reaction for a rational CEO should be negative.

Note that the assumption of symmetric information implies, in particular, that the announcement of the merger does not convey any information about the fundamentals of the acquiring company. In practice, information revelation will have an impact on the announcement effect.²⁷ For simplicity, we assume that the average effect of such information revelation is the same among overconfident and rational CEOs.

3 Data

We analyze a sample of 477 large publicly-traded United States firms from the years 1980 to 1994. To be included in the sample, a firm must appear at least four times on one of the lists of largest US companies compiled by Forbes magazine in the period from 1984 to 1994.²⁸

The core of the data set is described in detail in Hall and Liebman (1998) and Yermack (1995). The virtue of this data is that it provides us with detailed information on the stock ownership and set of option packages – including exercise price, remaining duration, and number of underlying shares – for the CEO of each company in each year. From this data we obtain a fairly detailed picture of the CEO’s portfolio rebalancing over his tenure.

In order to examine the relationship between a CEO’s transactions on his personal account and his transactions on corporate accounts, we supplement Hall and Liebman’s data set with merger data from the SDC and CRSP merger databases. Both data sets give us the announcement

²⁷see Hietala, Kaplan, and Robinson (2002).

²⁸Forbes compiles four lists that rank companies based on sales, profits, assets, and market value. One important implication of restricting attention to this subset of large U.S. companies is that it 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.

date and means of financing for mergers conducted by our sample of firms.²⁹ The CRSP data set contains this information for mergers in which the target firm is a CRSP-listed firm. We use the SDC data primarily to supplement the set of mergers with acquisitions of private firms and large subsidiaries. Following Morck, Shleifer, and Vishny (1990), we omit mergers in which the value of the target is less than five percent of the value of the acquiror.³⁰

We also 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. We measure 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 investment and 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 total assets (item 6) minus total liabilities (item 181) minus preferred stock (item 10) plus deferred taxes (item 35) plus convertible debt (item 79). When preferred stock is missing, we replace it with the redemption value of preferred stock. Book value of assets is total assets (item 6).³¹ Further, we use fiscal year closing prices (item 199) adjusted for stock splits (item 27) to calculate annual stock returns.

In addition, we collected 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 technical, financial, or miscellaneous. Finally, we use CRSP to gather stock prices as well as 2 and 4 digit SIC codes for the companies in our sample and the target firms in CRSP acquisitions.

Table 1 presents summary statistics of the data, divided into firm-specific and CEO-specific variables, as well as correlation estimates of many of the key variables. Table 2 presents summary statistics of the mergers undertaken by CEOs in our sample. Merger financing summary statistics are provided in Table 3. In addition, Appendix A explicitly defines most of the variables used in the regression analysis and Appendix B describes the industry classifications

²⁹The SDC data contains, in addition, the amount the acquiror paid for the target and the target's primary SIC code.

³⁰This selection criterion is especially important here 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.

³¹Definitions as in Fama and French (2000).

used in the paper.³²

4 The Impact of Overconfidence on Acquisitiveness

4.1 Measure of Overconfidence

We use the timing of option exercises to identify overconfidence. Previous literature in corporate finance finds that risk-averse, underdiversified executives typically should not hold their options until expiration (Carpenter, 1998; Hall and Murphy, 2002). Black and Scholes (1973) demonstrate that a diversified investor should value options as if he were risk-neutral and, therefore, never forgo option value by exercising an option early. Unlike outside investors, however, a CEO cannot trade his options or hedge the risk by short-selling stock of his company. CEO compensation contracts regularly contain large quantities of stock and option grants in lieu of cash compensation. To maximize the incentive effects of these holdings, boards prohibit their CEOs from perfectly hedging against the risk by selling company stock short. The employment contract of a CEO also limits the frequency and quantity of divestitures he may undertake in any given year. As a result, the CEO's portfolio is likely to include too much of his own company's idiosyncratic risk. In addition, the CEO's human capital is invested in the firm, so that a bad outcome in his firm will not only negatively impact his personal portfolio, but also reduce his outside options. This reputational effect increases the CEO's overexposure to his firm's idiosyncratic risk, and the Black-Scholes formula will not apply. A CEO instead must trade-off the option-value of holding his stock options against the costs of underdiversification. Though the optimal schedule for early exercise depends on his individual wealth, degree of risk-aversion and diversification, it is generally true, in the absence of inside information, that a risk-averse CEO should exercise his options early given a sufficiently high stock price.

In our data, we find that certain CEOs' behavior cannot be reconciled with such models. The typical option in our sample has a duration of ten years and is fully vested after four years. 16% of the CEOs in our sample hold an option at least once until the year of expiration. Further, these options are typically highly in the money: the median percentage in the money at the beginning of the final year is 253%. Regardless of the exact calibration of risk aversion, diversification, and wealth, a model of optimal exercise will predict that such an option will be exercised long before the final year.³³ Thus, holding such an option until its final year, even

³²All variables not defined in Appendix A are explicitly defined in each table on which they appear.

³³As a frame of reference, Hall and Murphy (2002) find that a CEO should exercise an option during year 9 if it reaches 40% in the money during that year (given a constant coefficient of relative risk aversion equal to 3 and 67% of wealth in company stock).

when it is highly in the money, indicates that the CEO has been consistently “bullish” about the company’s prospects. We classify a CEO as overconfident (and set the dummy variable “longholder” equal to 1) if he ever during his tenure as CEO holds an option until the last year before expiration. Table 1(d) presents the correlation of our longholder measure with various firm and CEO characteristics.

We also conducted a systematic search for media portrayals of our CEOs using LexisNexis in an effort to confirm our measure of overconfidence. More specifically, we searched for relevant articles in *The New York Times*, *Business Week*, *Financial Times*, and *The Economist*. We recorded the number of articles referring to each CEO as “confident;” the number of articles referring to him as “optimistic;” and the number of articles referring to him as “reliable,” “conservative,” “cautious,” “steady,” “practical,” or “frugal.”³⁴ Using this raw data, we can compare the media perception of our CEOs with the way we characterize them based on active decisions on their personal portfolios. To do this, we construct an indicator variable which takes the value 1 whenever the number of “confident” and “optimistic” articles on the CEO (removing any “not confident” or “not optimistic” articles) exceeds the number of “reliable,” “conservative,” “cautious,” “steady,” “practical,” and “frugal” articles. We find that this indicator variable is strongly positively correlated with our “longholder” variable – the correlation is 0.2043. Thus, the press search seems to independently corroborate our interpretation of the CEOs’ option exercise decisions.

Our “longholder” measure of overconfidence relies on a CEO’s failure to diversify his personal portfolio. Thus, an alternative measure of overconfidence might be high levels of equity ownership. These holdings might be in the form of stock or large numbers of vested stock options. We do not take this approach for two main reasons. First, the effect of ownership level is difficult to interpret because it also (and perhaps primarily) confers incentives on the CEO. Second, the level of ownership does not fully reflect active decisions by the CEO. For example, the board of directors can offset any changes in the level of equity ownership by giving the CEO new stock grants whenever he sells company shares.³⁵ Holding a vested stock option, on the other hand, represents a conscious decision by the CEO to bet on the company’s future returns rather than taking the current value of the option and investing it in a diversified portfolio.

One potential drawback of our measure is that it primarily captures overconfidence about the firm’s performance rather than overconfidence about the quality of potential merger projects.

³⁴In the process of conducting searches, we manually scanned each article to ensure that the adjective in question was actually used in reference to the CEO. As a result, we were also able to count separately any articles that explicitly referred to the CEO as “not confident” or “not optimistic.”

³⁵Of course, they might simultaneously reduce cash components of compensation to avoid changing the overall value of the CEO’s pay package.

Our assumption, however, is that the true quantity of interest is the manager’s overconfidence in his own abilities. Thus, we should observe overconfidence about the CEO’s own firm and about potential merger projects together in the data.

Of course, an important alternative explanation of holding options that are highly in the money is inside information. Though it seems implausible that CEOs would, through their entire tenure, have highly persistent, positive inside information about their company, we will nevertheless address this issue more fully in Subsection 4.3.

4.2 Empirical Specification

To test the effect of managerial overconfidence on acquisitiveness, we use the following general regression specification:

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

where O is the “longholder” overconfidence measure and X is the set of controls. X usually includes Tobin’s Q , cash flow, size, corporate governance, ownership, total number of vested options (normalized by total number of shares outstanding)³⁶ and year fixed effects. Y is a binary variable that, in most of our specifications, 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.³⁷ The null hypothesis is that β_2 , the coefficient on overconfidence, is equal to zero.

Our goal in this paper is to measure the effect of a manager-specific trait, overconfidence, on the latent variable, acquisitiveness. There are two kinds of variation we can use to identify this effect. The first is cross-sectional variation between firms with an overconfident CEO and firms with a rational CEO. For example, Wayne Huizenga is the CEO of Cook Data Services (or Blockbuster Entertainment Group) for all 14 years the firm appears in our data. Since, during those 14 years, he holds some options until the year of expiration, we classify him as overconfident under our “longholder” measure. He also, during those 14 years, conducts 6 acquisitions. By contrast, J. Willard Marriott of Marriott International is CEO of his company for all 15 years of our sample. But, he never holds an option until expiration (and thus is not a

³⁶We multiply the normalized option holdings by 10 so that the mean is roughly comparable to the mean of stock ownership.

³⁷We have confirmed, wherever econometrically possible, the robustness of the estimates to the assumption that G is normal.

“longholder”). He also never conducts an acquisition. By comparing these two types of CEOs, we can identify an effect of overconfidence on acquisitiveness.

The second type of variation is variation between different CEOs within the same company. For example, Colgate Palmolive is in our sample for 15 years. For the first 4, the CEO is Keith Crane. Mr. Crane never holds an option until expiration (and thus is not a “longholder”) 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, thus, is a “longholder.” He also conducts 4 acquisitions. So, by comparing overconfident CEOs within a particular firm to rational CEOs in the same firm, we might also identify a positive effect of overconfidence on acquisitiveness.³⁸

We estimate Equation (1) using three estimation procedures. The first specification, a logit regression, makes use of both types of variation. This procedure, however, does not account for the possibility of firm-specific effects on the estimates. The second, a logit regression with random effects, also makes use of both types 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 (1) using a logit regression with fixed effects.³⁹ This specification makes use only of the second type of variation. That is, we estimate the effect of overconfidence on acquisitiveness using only variation between overconfident and rational CEOs within a particular firm. The procedure mirrors the approach Bertrand and Schoar (2001) take in measuring managerial fixed effects on corporate outcomes. After eliminating any possible firm effect on average acquisitiveness, we can attribute the remaining differences in average acquisitiveness across managers to characteristics of the managers themselves. In our case, this characteristic is managerial overconfidence.

In the remainder of this section, we estimate the average effect of overconfidence on acquisitiveness using Equation (1). We also use our empirical proxy of overconfidence to test Predictions 1 and 2 of our model. In addition, we perform supplementary tests to address alternative explanations for our estimates of β_2 .

³⁸Interestingly, a systematic search in the Wall Street Journal for the period 1979 to 1994, leads us to 4 articles that refer to Wayne Huizenga as “confident” or “optimistic” and 2 that refer to Reuben Mark using those same terms. Our LexisNexis searches turned up 3 and 1 additional articles, respectively. However, we do not find a single article referring to either J Willard Marriott or Keith Crane as “confident” or “optimistic.”

³⁹We use conditional logit in order to estimate the fixed effects model consistently. By conditioning the likelihood on the number of successes in each panel, we avoid estimating the coefficients of the fixed effects themselves. As a result, this procedure produces consistent estimates of the remaining coefficients.

4.3 The Overall Impact of Overconfidence

The appeal of overconfidence as a general explanation of merger activity hinges on its effect on average acquisitiveness. A positive effect of overconfidence on average is not necessary for the overconfidence hypothesis to hold. However, such a finding would indicate that overconfidence explains a significant amount of observed merger activity. Thus, we first estimate Equation (1) on our entire sample of firm years.

Table 4 contains the results. The dependent variable in all regressions is binary, where 1 indicates that the firm made at least one successful takeover bid in that firm year.⁴⁰ The first column is a logit estimation on only our longholder overconfidence measure. We find a positive and strongly significant coefficient.⁴¹ In addition, the magnitude of the coefficient is quite large. We find an odds ratio of 1.65; that is, the odds of an overconfident manager making a successful takeover bid are 1.65 times the odds of a rational manager doing the same. More specifically, the odds of a rational CEO making a successful bid are 0.099 (or about 1 in 10) and the odds for an overconfident CEO are roughly 0.163.

In the remaining columns of Table 4, we modify the analysis to account for other potential factors in the decision to conduct a merger. In column 2, we include 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, an indicator for efficient board size as a measure of corporate governance⁴², and cash flow as a measure of available internal resources. We also 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.

⁴⁰The results are similar when we include failed bids in the dependent variable. We also find that overconfident CEOs are significantly less likely to withdraw from a deal, conditional on making a bid. This effect may arise because of overconfidence or because overconfident managers display a systematically different behavior from rational managers. For example, if rational managers make more intra-industry bids, they may be more prone to anti-trust litigation. Regardless, we restrict attention to completed bids given the apparent differences between the two types of bid.

⁴¹The standard errors are robust to heteroskedasticity and unspecified within-firm correlation. We also, alternatively, calculated standard errors that are robust to heteroskedasticity and unspecified within-year correlation. Because this modification results in smaller standard errors, we concluded that within-firm serial correlation is the more serious issue for our analysis.

⁴²The corporate governance literature suggests that an effective board should have no more than 12 members. The results are robust to the inclusion of the logarithm of board size, the number of CEOs of other companies sitting on the board, or the percentage of the board made up of CEOs of other companies as alternative measures of governance.

The effects of these controls appear largely orthogonal to the effect of overconfidence. That is, CEOs who persistently hold options are still significantly more acquisitive on average. On the surface, it appears that smaller firms are more likely to conduct a merger; however, much of this result may be driven by mechanical within-firm, time series variation.⁴³ That is, assets at the beginning of a year in which a merger occurs will necessarily be smaller than assets at the beginning of the following year. Because our sample already selects firms based on size, this effect can overwhelm the cross-sectional variation.⁴⁴ We also find that 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.⁴⁵ Further, more cash flow leads to more acquisition activity. This effect may arise due to financing considerations or because cash flow proxies for recent firm success. Effective corporate governance strongly mitigates CEO acquisitiveness. Stock ownership appears to have a positive, though insignificant, effect on acquisitiveness in the cross-section, but the effect reverses when we restrict attention to within-firm variation (Column 5). High levels of vested options have a positive impact on acquisitiveness in the cross-section. It is possible that this variable is already a very noisy proxy for overconfidence, since exercising options reduces option holdings (*ceteris paribus*). However, the level of CEO option holdings is determined more by the board and the CEO’s compensation contract than by the CEO himself. So, we are reluctant to interpret level effects as evidence of overconfidence.

Column 3 adds year fixed effects to the regression. As noted in the introduction, the literature has identified a myriad of variation over time in the characteristics of merger activity. Controlling for this variation, however, does not impact our estimates of the overconfidence effect. Similarly, Column 4 adds industry fixed effects and the interaction of industry effects with the year effects to the regression.⁴⁶ This specification allows us to control for the possibility that mergers cluster within industries over time.⁴⁷ Again, there is only a negligible impact on the results.⁴⁸ Thus, overconfidence appears to be an explanation of merger activity that

⁴³Compare, e.g., columns 2, 3, and 4, which include both cross-sectional and within firm variation, to column 5, which includes only within firm variation.

⁴⁴Because of these undesirable characteristics of the size effect, we reran the regressions excluding size as a robustness check. The remaining coefficients were not affected.

⁴⁵This 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).

⁴⁶Here standard errors are adjusted for clustering within industry, rather than firm.

⁴⁷see, e.g., Andrade, Mitchell, and Stafford (2001) for evidence to this effect.

⁴⁸Because the impact of including industry effects and their interaction with time effects is so small, we omit this specification when we proceed to alternative explanations in the next subsection. However, when we make changes besides the inclusion of additional controls in later sections, we report this specification as well.

generalizes across merger waves.

Finally, Columns 5 and 6 control for unspecified firm-specific variation in the probability of conducting a merger. Though the regression in Column 3 explicitly addresses the most natural firm characteristics that might affect acquisitiveness, there may be an omitted, or even unobservable, firm-specific variable that leads to more acquisitiveness and positively correlates with our overconfidence measure. To rule out this possibility, we first explicitly model the average probability of conducting a merger within each firm as a random draw from a normal distribution. The random effects specification controls for potential firm-specific effects on merger activity without eliminating all between firm variation from the analysis. As reported in Column 5, taking this step actually increases both the magnitude and significance of our estimate of the effect of overconfidence on acquisitiveness. Thus it seems unlikely the overconfidence effect could be explained by firm-specific factors.

In Column 6, we are even more restrictive. We eliminate firm fixed effects on acquisitiveness and identify the overconfidence effect only off of cases where an overconfident manager either precedes or follows a rational manager within a firm. Here the magnitude of the overconfidence effect substantially increases. An overconfident manager now has 2.65 times the odds of doing a merger compared to a rational manager.⁴⁹

Thus, overconfidence appears to be a very important determinant, on average, of merger activity.

Alternative Explanations. Before examining the specific predictions of our model, we briefly address several alternative interpretations of our findings. Many of the alternative stories can explain either heightened merger activity or excessive option holding quite convincingly. However, they typically cannot account for one, or more, of the empirical findings of this and the remaining sections of the paper.

Insider information. Perhaps the most important competing explanations for prolonged holding of executive stock options revolve around asymmetric information. Suppose, for example, the CEO has private information that stock prices will rise in the coming year due to an upcoming or recently completed merger. Then, he will not exercise his options, even if they are vested and highly in the money. This story might explain why we find an increased propensity to acquire among managers who hold options until expiration.

⁴⁹In the fixed effects (or conditional) logit specification, it is not possible to estimate standard errors that are robust to clustering at the firm level. If we instead estimate the fixed effects logit model using traditional logit and including dummy variables to estimate the fixed effects, we find that errors with firm-level clustering are actually slightly smaller than the errors from the conditional logit specification.

This explanation, however, suggests that we would observe insider trades right around the merger. This does not seem to be the case empirically (Boehmer and Netter, 1997). Moreover, if this story were the main explanation of our findings, we would not expect a uniform distribution of mergers across the tenure of CEOs who hold options until expiration. In particular, we should see a concentration of mergers right before the option expires. Returning to the Blockbuster and Colgate Palmolive examples, Wayne Huizenga holds an option that expires in 1993. If he held this option because he had inside information about his merger projects, we should expect to see his mergers concentrated in the last years of that option's duration (e.g. 1991-1993). Instead, we observe that Mr. Huizenga conducts four mergers between 1988 and 1990 and two between 1991 and 1993. Similarly, Reuben Mark holds an option that expires in 1992. Between 1990 and 1992, he conducts one acquisition. But, between 1985 and 1988, he conducts three.

In Table 5, we test for similar evidence in our entire sample of overconfident CEOs. We run a random effects logit regression of Equation (1). We replace longholder with an indicator for the last 3, 4, or 5 years of an option that is held until expiration and condition on longholder being equal to 1. With our usual set of controls (stock ownership, vested options, corporate governance, size, Tobin's Q, cash flow, and year fixed effects), we do not find any evidence that overconfident CEOs are more likely to conduct mergers in the particular period we use to identify them as overconfident, i.e. in the last 3, 4 or 5 years of the duration of an option that is held until expiration.

We, then, estimate Equation (1) on the entire sample. But, we split longholder into two dummies: an indicator for the last 3 (4 or 5) years of an option that is held until expiration and an indicator for the remaining years of the overconfident CEO's tenure. In two of the three specifications – the last 4 and 5 years of the duration of a longheld option – we find no significant difference between the effect of overconfidence on acquisitiveness for years in which the CEO is holding the vested option and when he is not. In the third specification – the last 3 years of the duration of a longheld option – we find weak evidence that the effect on acquisitiveness is actually smaller while the CEO is holding the option. Thus, the effect of longholder on acquisitiveness seems to be truly a managerial fixed effect. Overall, there is little evidence that the specific time during which the manager is holding a vested option (that he eventually holds until expiration) matters for the timing of his merger decisions.

Of course, the CEO may have held the option due to private information about the company's prospects unrelated to his merger projects. Though it is difficult to explain how this form of private information would lead to heightened acquisitiveness, we can nevertheless address its potential impact on our overconfidence measure. In Table 6, we calculate the hypothetical

returns that longholder CEOs could have realized had they exercised their options even one year before expiration and invested the proceeds in the S&P 500.⁵⁰ 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 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 find that the heightened acquisitiveness among longholder CEOs is due almost entirely to CEOs who more often than not lost money by holding their options until expiration. Thus, inside information appears to have little power to explain the properties of our longholder measure.

Signalling. A closely related story, that also derives from an information asymmetry about the merger, is that longholder CEOs are holding their options until expiration as a signal to the market about the merger. Again, the fact that the timing of option holding does not appear to correlate with the timing of mergers casts doubt on this alternative explanation of our results. Further, as we will see in Section 5, the market responds more negatively to the mergers conducted by “longholder” CEOs than by their peers. Thus, holding options until expiration does not convey positive information about the merger to the market.

Stock price bubbles. One explanation for merger activity recently developed by Shleifer and Vishny (2002) suggests that CEOs conduct mergers in response to stock price bubbles.⁵¹ More specifically, CEOs trade their overvalued equity for the real assets of the target company. This story can incorporate the observed (non-)exercise behavior if managers want to reap the benefits of the bubble or to avoid “popping” it with a negative signal.

One immediate piece of evidence that speaks to this story is that our results are robust to the inclusion of time fixed effects. Thus, to the extent that the “overvaluation” is a market-wide phenomenon, we have already controlled for it. A second piece of evidence is our fixed effects logit estimation (see Table 4). In particular, we find an effect of longholder on the probability of conducting a merger even eliminating all cross-sectional variation among firms. Thus, what remains to be shown is that the probability of doing a merger does not move with the stock price of a particular firm. That is, lagged stock returns do not explain both the probability of doing a merger and our longholder indicator. So, we reestimate Equation (1), adding five lags of stock returns to our set of controls. The results are presented in Table 7.

⁵⁰We make this calculation for all CEOs whose options were at least 40% in the money at the start of the final year. The behavior of the remaining longholder CEOs in the penultimate year of the option’s duration is consistent with the predictions of Hall and Murphy (2002). See footnote 33.

⁵¹See also Dong, Hirshleifer, Richardson, and Teoh (2002)

We find that our estimates of the effect of longholder on acquisitiveness are nearly unaffected by these additional controls. In the fixed effects logit specification, longholder still has a highly significant coefficient of 2.58. In addition, the lags of returns, though positive, rarely have individually significant impacts on the probability of conducting a merger.

Stock price volatility. High volatility of the underlying asset increases option value. Thus, a potential reason why some CEOs may hold their options longer than their peers is that their company's stock is more volatile. Such behavior of CEOs on their personal account is linked to increased acquisitiveness if these CEOs conduct mergers to diversify the corporate account.⁵² Indeed, we will show in Section 4.4 that much of the acquisitiveness of overconfident CEOs is due to diversifying mergers.

However, the fact that we find a significant positive effect of overconfidence using a fixed effects logit specification in Table 4 implies that cross-sectional variation in volatility among firms cannot explain our results. But, variations in volatility across the tenures of CEOs in the same company could potentially confound our results. Table 8 presents estimates of Equation (1) including our usual controls and adding the annual volatility of returns as a control. It turns out that volatility has no explanatory power for the time series of merger activity within a firm. And, our estimate of the overconfidence effect is virtually unchanged – the coefficient of longholder in the fixed effects logit specification is 2.64.

Risk Neutrality. Another reason CEOs may hold options until expiration is that they are risk neutral. Or, alternatively, they manage to perfectly hedge the risk of their options, despite the prohibition of trading and short sales. However, shareholders should prefer a risk neutral CEO over a risk-averse CEO since they are not prevented from diversifying their portfolios. So, if risk aversion dampens acquisitiveness and longholder measures risk neutrality rather than overconfidence, the market should react positively to bids by longholder CEOs. In Section 5, we show instead that the market discounts the stock of longholder CEOs upon making a bid more than the stock of “exercisers.”

Finance Education and Other Personal Characteristics. To test whether educational background may determine both the option exercise and the merger behavior of CEOs, we estimate Equation (1) including an indicator of financial education among our usual controls. We consider an MBA, a Ph.D. in economics or finance, an undergraduate degree in finance, or similar educational backgrounds to constitute a finance education. The results are presented in Table

⁵²Amihud and Lev (1981).

9. Unfortunately, data limitations on educational background substantially alter the size of the sample compared to Table 4. However we still find that longholder has a positive and significant effect on acquisitiveness in two of the three regression specifications. In the third, the fixed effects logit, the effect is quite strong (an odds ratio of 5.70), but has a p-value of 0.13. Interestingly, finance education also has a positive effect on acquisitiveness. But, the correlation between longholder and finance education is only 0.05.

There are other explanations of why CEOs may hold options until expiration (like procrastination) or conduct more mergers than their peers. These stories, however, cannot simultaneously explain takeovers and excessive option holding. So, we omit discussion of them here.

Robustness. We briefly discuss the robustness of our results to changes in the empirical specification.

Overconfidence Measure 2—Is the Option in the Money? Our longholder measure of overconfidence is appealing in its simplicity: we classify a CEO as overconfident if he ever holds an option until expiration. Of course, holding an option that is under water until expiration would clearly not be indicative of overconfidence. Conversely, the higher an option is in the money, the more delayed exercise indicates likely overconfidence. As a robustness check of our measure, then, we add an additional condition for being classified as overconfident. Specifically, we require that the option that is held until expiration be at least $x\%$ in the money at the beginning of its final year. We vary x between 0 and 100 by increments of 10. As we increase x , the classification as overconfident becomes more restrictive. At the same time, we hold the definition of “rational” option exercise behavior constant, i.e. we require that the CEO never holds an option until the final year. This restriction keeps the comparison group the same across all regressions.⁵³

Figure 10 presents the coefficients on these modified proxies for overconfidence in estimates of Equation (1). We present three regression specifications (logit, random effects logit and fixed effects logit). All three specifications include our usual set of controls (stock ownership, option holdings, size, Tobin’s Q, cash flow, corporate governance, and year fixed effects). In the logit and random effects logit specifications, we find a roughly constant coefficient on overconfidence as we vary x . In the fixed effects logit specification, the coefficient appears to modestly increase. We conclude that the effect of longholder on acquisitiveness is not driven by CEOs with out-of-the money options.

⁵³The results are similar if we instead group longholders who do not meet the more stringent requirements together with the “rational” CEOs.

Overconfidence Measure 3—Does the CEO Always Hold his Options? Thus far, we have classified CEOs as overconfident if they ever held an option until expiration. A natural alternative is to consider a CEO as overconfident only if he always holds his option packages until expiration. Of course, this restriction is quite severe: when we require that an overconfident CEO never exercises an entire option package before expiration, we reduce our sample of overconfident CEO years from 719 to 243. In Table 11, we present the results of estimating Equation (1) with this alternative definition of overconfidence. As above, we hold the comparison group constant, i.e. we classify a CEO as “rational” only if he never holds an option until the end.⁵⁴

We find that the effect of overconfidence on acquisitiveness is still strong and significant in all three of our regression specifications. In the fixed effects logit, for example, overconfident CEOs have 2.52 times the odds of conducting a merger relative to rational peers.

Rational CEOs. Throughout the analysis, we have identified CEO overconfidence using option exercise behavior that indicates the CEO’s strong optimism about the future stock price of his company. As a further robustness check of our results, we introduce a comparable benchmark for “rational” option exercise behavior. Rather than classifying all CEOs whose behavior does not indicate overconfidence automatically as “rational,” we include CEOs in the “rational” control group only if they are habitual “early exercisers.” To construct such a benchmark, we first calculate that the average remaining duration on an option package when the CEO exercises the last portion is 5.24 years. We classify CEOs as “early exercisers,” and thus extremely unlikely to be overconfident, if they always exercise their option packages, in entirety, while they still have 6 or more years of duration remaining. While Table 11 compared CEOs who always exercise late to CEOs who never exercise late, here we go a step further. We compare CEOs who always exercise late to CEOs who always exercise early. Table 12 contains the results. As before, overconfidence has a positive and significant effect on CEO acquisitiveness.

Other Personal Characteristics. Recent research, including Bertrand and Schoar (2001) and Malmendier and Tate (2001), has shown the effects of personal characteristics other than overconfidence on corporate decisions. Here, then, we examine the effects of other personal characteristics on the probability of conducting a merger. We estimate Equation (1) including Morck, Shleifer and Vishny’s “boss” variable⁵⁵, age, and tenure as additional controls. The results are in Table 13. We find that none of these variables have significant effects on acquisitiveness. Further, they appear to be orthogonal to our longholder measure of overconfidence.

⁵⁴We find similar results if we change the definition of “rational” as well and include CEOs who sometimes (but not always) hold options until the end.

⁵⁵Morck, Shleifer and Vishny (1989) analyze the effect of holding the titles of president and chairman of the board in addition to being CEO on acquisition decisions.

Of particular interest is the effect of age on acquisitiveness. While it remains below conventional levels of statistical significance, the effect is consistently negative. In Malmendier and Tate (2001), we find that age (specifically in the form of membership in the 1920s cohort) leads to increased sensitivity of corporate investment to cash flow. The results here suggest that this effect on investment is not the same as the overconfidence effect. Rather than restricting investment to avoid issuing equity they perceive as undervalued due to overconfidence, older CEOs are, perhaps, excessively conservative in investment financing and merger decisions.

4.4 Overconfidence and Diversifying Mergers

We have found that overconfident managers, on average, are more likely to make a successful merger bid than rational peers. The empirical results suggest that exuberance about potential merger synergies dominates the countervailing effect of perceived undervaluation. Our model of overconfidence, however, delivers more specific predictions.

According to our model of overconfidence, overconfident managers are more likely than rational managers to undertake a merger project that, *ex ante*, is unlikely to increase value (see Prediction 1 in Section 2). Thus, the average effect of overconfidence on the probability of doing a merger might reflect the greater average propensity of overconfident managers to do bad mergers. In this Subsection, we both analyze the relative propensity of overconfident and non-overconfident managers to undertake bad mergers (Prediction 1) and investigate whether the average effect of overconfidence is indeed due to “ill-advised” mergers by overconfident managers.

To test Prediction 1, we must identify a subset of mergers that, *ex ante*, is unlikely to create value. That is, we need to find merger characteristics that are typically “red flags” to market participants (and, presumably, rational managers) as soon as the merger opportunity presents itself. We hypothesize that diversification is such a characteristic. Certainly, there is ample support in the academic literature for this assumption. Equally important for our story, however, is that the market seems to recognize in advance that many diversifying bids are unwise. But, the acquiring CEO, (over-)confident that his assessment of the merger’s prospects is correct, presses on despite the negative signals from the market.

Shefrin (2000) chronicles AT&T’s 1990 acquisition of NCR using exactly this paradigm.⁵⁶ When AT&T CEO Robert Allen was confronted with the dismal track record of computer - telecommunications mergers (highlighted by IBM’s acquisition, and later divestiture, of Rolm),

⁵⁶Lys and Vincent (1995) also provide extensive analysis of this deal with similar conclusions.

he conceded that “it’s going to be tough’ not to repeat history...but...the NCR deal offered AT&T unique opportunities to increase its core telecommunications business and enter the emerging market for networked cooperative computing.” (p. 229) Charles Exley, chairman of NCR and critic of the deal, pointed out that such takeovers had typically turned out to be “calamities,” largely because the mergers prevented management from focusing on the constituent firms’ “core competencies” (p. 231). The pessimism of the market, and even target management, proved accurate: NCR’s subsequent profitability fell far below projections and, by 1995, AT&T had massively restructured what remained of NCR. Not surprisingly, our longholder measure identifies Robert Allen as overconfident.

Using diversification as a proxy for mergers with negative expected value, we estimate Equation (1) with a dependent variable that indicates a successful diversifying bid in a particular firm year. We define a diversifying bid as one in which the acquiror and target firms are not members of the same industry, where industries are defined as in Fama and French (1997). For comparison, we also estimate Equation (1) with a dependent variable that indicates a successful intra-industry bid. Table 14 summarizes the results. We find strong evidence for our prediction: overconfident managers are far more likely to do diversifying mergers than rational managers. In the fixed effects logit specification, the odds ratio on the longholder measure of overconfidence is 3.61. By comparison, the effect of overconfidence on all mergers, reported in Table 4, is 2.65. And, though the effect of overconfidence on the likelihood of making a related bid appears to be positive (1.48), the z-statistic of 0.71 is far below conventional standards of significance.

Thus, it appears that overconfident managers are more likely to complete bids of all types. However, the economically large and statistically significant effect of overconfidence on acquisitiveness is due mainly to overconfident managers conducting more destructive mergers. This finding also confirms Prediction 1 of our model.

4.5 Internal Resources and the Overconfidence Effect

Another key implication of our model, formalized in Prediction 2, is that overconfidence should matter more for firms that have more internal resources. If a firm has a sufficient stock of cash on hand to finance a potential acquisition without issuing equity, then perceived undervaluation by the capital market will not dampen the CEO’s enthusiasm for the project.

Similarly, untapped debt capacity can allow the CEO to conduct a merger without issuing “mispriced” equity. A CEO who overestimates a potential merger’s returns may ex ante believe it will be profitable even in the states of the world that ex post correspond to default.

Then, even if he views debt as too expensive given his perception of the acquisition’s value, he may accept it rather than foregoing the project altogether. In other words, debt allows the CEO, and the shareholders whose interests he values, to remain the residual claimant on all of the merger’s future value. This effect is even more clear if the CEO can issue riskless debt to finance the deal.

Thus, we expect to find that managers of firms with the most cash resources and untapped debt capacity, or conversely the least dependence on the equity market, have the most pronounced effect of overconfidence on acquisition decisions. To test this prediction, we employ the Kaplan-Zingales index, which has been used to measure equity dependency by Lamont, Polk and Saá-Requejo (2001), Baker, Stein, and Wurgler (2001), and Malmendier and Tate (2001).

Kaplan and Zingales (1997) use direct measures of financing constraints, including information from annual reports and information gleaned directly from the company’s executives, to classify firms as either constrained or unconstrained. They then estimate an ordered logit of this classification on five accounting ratios that might explain these financial constraints. Specifically, these variables are cash flow to total capital, Q , debt to total capital, dividends to total capital, and cash holdings to capital. Recent research uses the estimates of this ordered logit regression to construct an index of financial constraints (or equity dependence) as follows:

$$\begin{aligned}
 KZ_{it} = & -1.001909 * \frac{CF_{it}}{K_{it-1}} + 0.2826389 * Q_{it} + 3.139193 * Leverage_{it} \\
 & -39.3678 * \frac{Dividend_{it}}{K_{it-1}} - 1.314759 * \frac{C_{it}}{K_{it-1}}
 \end{aligned}$$

Higher values of the linear combination of the five ratios implies a higher degree of equity dependence⁵⁷. Thus, Prediction 2 would be confirmed if the effect of overconfidence is strongest for the subsample of firms which have the lowest values of the Kaplan-Zingales index.

So, we divide our sample into quintiles of the Kaplan-Zingales index and estimate Equation (1) separately on each quintile. 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. The results of our estimation are in Table 15.⁵⁸ In Panel 1,

⁵⁷For this test, we use a different definition of Q from the rest of the paper in order to conform to the definitions used by Kaplan and Zingales and to avoid rendering the weights meaningless. The ratios, in terms of COMPUSTAT data items are as follows: 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 = item21 + item 19) / item 8 ; cash to capital = item 1 / item 8. Item 8, capital, is always taken at the beginning of the year (lagged).

⁵⁸We only estimate the regression using random effects logit regression. The effects are similar using simple

the dependent variable indicates that the firm made at least one successful bid in a particular firm year. We find, as predicted, a positive and significant effect of overconfidence in the “least constrained” quintile (the odds ratio on overconfidence in the random effects logit regression of Equation (1) is 2.06) and no significant effect in the “most constrained” quintile. We check that the large difference is not due to a lack of sufficient mergers to identify the effect rather than the interaction of overconfidence with perceived undervaluation. We find that the number of successful bids is virtually identical in the most and least constrained quintiles: 69 mergers are completed in the “most constrained” quintile and 65 are completed in the “least constrained” quintile.

In Section 4.4, we showed that overconfident managers are particularly prone to make diversifying bids. We also argued that, from an ex-ante perspective, diversifying mergers are less likely to generate future returns. Thus, the discrepancy in beliefs (between the market and an overconfident CEO) about the profitability of a diversifying merger is likely to be particularly high. In other words, the undervaluation effect when making a diversifying bid is likely to be particularly acute because the contribution of $\hat{\epsilon}$ to $\hat{V} - V$ will be particularly large. As a result, we expect to find an even starker demonstration of Prediction 2 when we limit our attention solely to diversifying mergers. The results of estimating Equation (1) by Kaplan-Zingales quintile with an indicator of a successful diversifying bid as the dependent variable are presented in Panel 2 of Table 15. As in Panel 1, we find a strong and significant effect of overconfidence among the least constrained managers (the odds ratio on overconfidence is 2.44) and no significant effect among the most constrained managers. Notably, the effect among constrained managers is larger here than in Panel 1. In addition, the effect of overconfidence appears to decline monotonically as we move progressively to more constrained quintiles of the index.

The data confirms Prediction 2 of our model: the effects of overconfidence on acquisitiveness are strongest for managers with abundant internal resources. We also find that this effect is most pronounced when we restrict attention to a class of value-destroying mergers most prevalent among overconfident managers.

The data also confirms an additional implication of our model, regarding merger-financing. We find that overconfident CEOs are indeed more likely, conditional on conducting a merger, to finance it using cash and debt. The effect is stronger when we consider mergers in which the value of the target is at least 25% of the value of the acquiror. For smaller mergers, all CEOs, both overconfident and rational, are likely to use cash. The size requirement eliminates much of this noise. Table 16 presents these results. The results become considerably stronger if we

logit. Fixed effects logit is not feasible since quintiling the sample leads to too few identifiable cases in some subsamples.

account for investor sentiment, i.e. if we allow for times of market over- and undervaluation. Specifically, we run a logit regression to estimate the probability of conducting a cash acquisition conditional on overconfidence, stock and option ownership, size of the target as a fraction of the acquiror's value, and over- or undervaluation. We find, as predicted by our model, that overconfident CEOs are particularly likely to conduct cash acquisitions when the effects of undervaluation are acute. In particular, when Tobin's Q is less than 1, overconfident managers are far more likely than rational managers to conduct a cash acquisition. Interestingly, CEOs do fewer cash deals when they are overvalued by the market. These results confirm both that overconfident managers are particularly sensitive to (perceived) market undervaluation and that investor sentiment affects merger financing decisions, as in Shleifer and Vishny (2002).

5 Market Reaction to Overconfidence

Studying mergers and acquisitions provides the opportunity to identify the market's reaction to the announcement of the deal. Many other corporate decisions, like investment, must be studied in aggregate due to limitations of disclosure and available data. In these cases, we cannot deduce the reaction of the market to any particular project. The only possibility of measuring investment performance, for example, is to look at firm performance over longer intervals (usually years) and try to explain those returns using past aggregate investment values. But, many other factors, including merger decisions, capital structure decisions, leadership changes, and organizational changes, are influencing those returns. Thus, any conclusions are tenuous at best.

With mergers, we know the exact date on which the project is announced and many details about the project itself. This allows us to measure market response to the announcement of takeover bids using daily stock returns. The short "windows" of observation limit the confounding effects of other corporate decisions on returns. And, we can draw specific conclusions about the effect of overconfidence on those returns.

5.1 Empirical Specification

To conduct this analysis, we use a variant of standard event study methodology.⁵⁹ The event window is the three days surrounding the announcement of the bid, starting at day -1 and

⁵⁹For comprehensive surveys of event study methodology, see Brown and Warner (1980 and 1985) and MacKinlay (1997).

ending on day +1 where day 0 is the day of the announcement.⁶⁰ We calculate the cumulative abnormal return to the acquiring firm’s stock over this window.

In standard “market model” event study methodology, α and β are estimated for each firm using a window of (typically) 100 days before the event window. These estimates of α and β are then used to compute expected returns during the event window. In order to avoid contaminating expected returns, then, it is necessary to ignore any events that occur during the “estimation” period. Thus, in effect, we must throw away cases in which a second merger follows soon after the initial merger in a firm year. However, we might hypothesize that doing multiple acquisitions in a year is itself a bad idea and a likely indicator of overconfidence. Since merging companies is likely to be highly disruptive – labor forces must be consolidated, corporate cultures must be adapted, etc. – it may be the height of hubris to assume that several such projects can be juggled at once. So, in order to incorporate these extra deals into our analysis, we follow the approach of Fuller, Netter, and Stegemoller (2002). Specifically, we eliminate the estimation period and use market returns on each day of the event window as our proxy for expected returns. This approach amounts to assuming that $\alpha = 0$ and $\beta = 1$ for the firms in our sample. These assumptions seem appropriate since our sample consists of 477 firms that appeared multiple times on the Forbes 500 lists of largest U.S. companies and represent a substantial portion of market returns.

Thus, 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

$$CR_i = \sum_t AR_{it}$$

And, we run the following cross-sectional regression:

$$CR_i = \gamma_1 + \gamma_2 O_i + X_i' G + \varepsilon_i \tag{2}$$

where O indicates an overconfident manager. X is the set of controls and typically includes managerial stock ownership and holdings of vested options, relatedness of the acquiring and target companies, means of merger financing, and efficient board size.

⁶⁰We use a three day window to minimize the effect of any noise in our proxy for expected returns; however, we find similar results using a window of five days (−2 to +2).

5.2 Does the Market Favor Rational Acquisitions?

Reviewing Prediction 3, we expect to find that overconfidence has a negative contribution to the mean cumulative abnormal return during the event window around the announcement of a subsequently successful takeover bid. That is, the market understands that, on average, the mergers undertaken by overconfident CEOs create less value.⁶¹

Table 17 presents the results of estimating Equation (2). We estimate five specifications of the regression. First, we include only stock ownership and vested options in our set of controls, X .⁶² Second, we add an indicator of relatedness (equal to 1 if the acquirer and target share a Fama-French industry group), an indicator of corporate governance (efficient board size), and an indicator of cash financed deals as additional controls. Third, we add controls for year fixed effects. Fourth, we add controls for industry fixed effects (measured using Fama-French industry groups) and their interaction with the year effects. And, fifth, we add age and an indicator of whether the CEO is also chairman of the board and president to the analysis.

The corporate governance control has the expected effect: good corporate governance is associated with higher cumulative abnormal returns. The same is true for high managerial stock ownership and vested option holdings (at least until they reach extreme levels). Similarly, the market views related mergers and cash financed deals more favorably, although the effect of relatedness is often just under conventional significance levels. Interestingly, the market views the deals of older CEOs less favorably (discounting roughly 4 basis points per additional year). Title accumulation, however, does not significantly affect merger returns.

Most importantly, our prediction is confirmed across specifications: the longholder measure of overconfidence has a significant negative effect on cumulative abnormal returns. In all specifications, the market discounts overconfident bids by roughly 75 basis points over the three day window, which translates to a loss of 49.2% per annum relative to the average merger of a non-overconfident CEO. We find a coefficient of -0.0072 controlling for industry and time effects and their interaction. Given a baseline negative announcement effect of 50

⁶¹If overconfident CEOs also pay larger premia over market value for their targets, then this effect will also show up in our estimate of γ_2 in Equation (2). However, our model does not have a strong prediction here: the magnitude of the “takeover premium” depends on the willingness to pay of the bidder, or potential bidder, with the second highest valuation. This quantity is independent of the acquiring CEO’s willingness to pay.

⁶²There appears to be a structural change in the effect of option holdings for CEOs with extremely large holdings. Thus, we split the option holding variable into “low” and “high” option holdings. “High” holdings is 0 for holdings in the bottom 99% of the distribution and equal to normalized option holdings in the upper tail. The CEOs in the tail have holdings (as a fraction of shares outstanding) as high as 0.32 (the mean holding is 0.0032 with a standard deviation of 0.014). The results are similar if, instead, we winsorize option holdings or simply exclude the outliers.

basis points, the additional discount for mergers of overconfident CEOs is large.

6 Acquisitiveness and Investment

In our paper “CEO Overconfidence and Corporate Investment,” we find that CEOs who are overconfident under our longholder measure have higher sensitivity of corporate investment to cash flow, on average, than their peers. The results of this paper together with our prior work suggest that overconfident CEOs are both more acquisitive and more investment-cash flow sensitive than their peers. Here we confirm that among CEOs who are classified as overconfident by the longholder measure, CEOs who conduct mergers have higher average sensitivities of investment to cash flow.

To perform this test, we consider the subsample of CEOs for whom the longholder indicator of overconfidence is equal to one. We first estimate an investment-cash flow sensitivity for each of these CEOs for whom we have at least three years of data in our sample. We use the following regression specification:

$$I_{it} = \beta_{i0} + \beta_{i1}CF_{it} + \beta_{i2}Q_{it} + \varepsilon_{it}$$

where I_{it} is CEO i 's investment during year t , CF is his cash flow during year t , and Q is the value of Tobin's Q for his firm at the beginning of year t . Then, we compute separately the average of β_{i1} for CEOs who, during their tenure, did at least one merger and for CEOs who did no mergers. We find that the average investment cash flow sensitivity among the acquirors is substantially larger than the average among the non-acquirors. Specifically, acquirors have an average β_{i1} equal to 0.61 and non-acquirors have an average β_{i1} of 0.40. Though the standard errors of these averages are quite large (β_{i1} is necessarily imprecise due to the small number of observations in each individual CEO's regression), this evidence suggests that two predicted behaviors of overconfident CEOs, heightened acquisitiveness and investment-cash flow sensitivity, go hand-in-hand in the data.

7 Conclusion

The main goal of this paper is twofold. First, we establish the effect of overconfidence on managerial acquisitiveness and, second, we explore the market's response to it.

Using the insights of the psychological evidence, we develop a simple reduced form model of the acquisition decision of an overconfident CEO. The model makes three testable predictions:

(1) Overconfident CEOs are more likely to undertake acquisitions that do not, in expectation, create value. (2) Overconfidence heightens acquisitiveness the most for CEOs with abundant internal resources. (3) The market discounts the acquisitions of overconfident CEOs.

We then test these predictions using data on a sample of Forbes 500 firms. We find strong evidence in support of the overconfidence hypothesis. Overconfident CEOs are more likely to undertake diversifying mergers, which are unlikely to create value on average, than rational managers. In addition, overconfidence has a strong positive impact on the probability of conducting mergers (and particularly of conducting diversifying mergers) among the least equity dependent firms (measured by the Kaplan-Zingales index) and no effect among the most equity dependent firms. Finally, the market prefers the bids of rational managers: cumulative abnormal returns around overconfident bids are roughly 75 basis points lower on average than for rational bids.

In addition, we find that overconfidence positively impacts acquisitiveness not only in special circumstances, but on average. That is, overconfidence has a strong positive impact on the probability of conducting a merger over our entire sample of firm years. Thus, overconfidence should be an important part of any theory intended to explain the causes of merger activity.

Our results have important implications for contracting practices and organizational design. In a sense, we can interpret overconfidence as an agency problem. However, standard incentives are unlikely to mitigate the detrimental effects of managerial overconfidence. And, overconfidence may be a more attractive assumption than pure “empire building” preferences, in which CEOs are perpetually and consciously disregarding the interests of the shareholders. Thus, overconfidence further motivates both the constraining role of capital structure on merger decisions and the importance of an independent board of directors. In addition, directors may need to play a more active role in project assessment and selection to counterbalance CEO overconfidence.

A Variable Definitions

Variable Name	Definition
<u>1. Dependent Variables</u>	
Successful Bid	Dummy variable equal to 1 if the company made at least 1 eventually successful merger bid during the fiscal year
Successful Diversifying Bid	Dummy variable equal to 1 if the company made at least 1 eventually successful diversifying merger bid during the fiscal year (relatedness=0; see below)
Successful Within Industry Bid	Dummy variable equal to 1 if the company made at least 1 eventually successful intra-industry merger bid during the fiscal year (relatedness=1; see below)
Successful Cash Bid	Dummy variable equal to 1 if a successful bid was financed using only cash and debt (defined for <i>all</i> acquisitions--even within the fiscal year)
Cumulative Abnormal Returns	Sum of daily abnormal returns to the acquiror's stock starting the day before the announcement of the bid and ending the day after. Abnormal returns are daily returns to the acquiror's stock minus the daily return to the S&P 500 index.
Investment	Capital expenditures (Item 128)
<u>2. Variables used for Normalization</u>	
Capital (lagged)	Property, plants, and equipment (Item 8)
Assets (lagged)	Total assets (Item 6)
<u>3. Control Variables</u>	
Q	(Market value of assets / Book value of assets) = (Total assets (Item6) + Market value of equity - Book value of equity) / Total assets (Item 6)
Market value of equity	Common shares outstanding (Item 25) * Fiscal year closing price (Item 199)
Book value of equity	Total assets (Item 6) - Total liabilities (Item 181) - Preferred stock (Item 10) + Deferred taxes (Item 35) + Convertible debt (Item 79)
Cash Flow	Earnings before extraordinary items (Item 8) + Depreciation (Item 14)
Stock Ownership	Percent of common stock owned by the CEO and his immediate family at the beginning of the fiscal year, even if the CEO disclaims beneficial ownership, unless the relative in question also works for the company. Does not include stock subject to options or
Vested Options	(Total number of CEO stock options exercisable within 60 days as of some date reported near the beginning of the fiscal year) / (Total number of shares of stock outstanding at the beginning of the fiscal year). We multiply this variable by 10 so that its
Corporate Governance	Dummy variable equal to 1 if the number of directors, as listed in the proxy statement near the beginning of the fiscal year, is between 4 and 12.
Size	$\ln[\text{lag of } \{\text{Total Assets (Item 6)}\}]$
Returns _t	$\ln[1 + \{(\text{stock price at the end of fiscal year } t-1 \text{ minus stock price at the end of fiscal year } t-2) / \text{stock price at the end of fiscal year } t-2\}]$. Stock price (adjusted for stock splits) is item 199 divided by item 27.
Volatility	$\ln[1 + \text{variance of returns on company equity}]$. The simple daily variance is calculated using the last 120 trading days of the fiscal year and then multiplied by 253, the typical number of trading days in a fiscal year.
Relatedness	Dummy variable equal to 1 if the acquiring and target firms share a Fama and French (1997) industry group.
Industry Effects	See Appendix B.
<u>4. Overconfidence Measure</u>	
Longholder	Dummy variable equal to 1, for <i>all CEO-years</i> if the CEO ever held an option until the last year prior to expiration.
<u>5. Personal Characteristics</u>	
Finance Education	Dummy variable equal to 1, for <i>all CEO-years</i> if the CEO had financial training. Financial education includes obtaining an MBA or Ph.D. in economics or finance. Undergraduate training in finance also qualifies.
Boss	Dummy variable equal to 1 if the CEO is also President and Chairman of the Board in a particular fiscal year.

COMPUSTAT item numbers in parentheses.

¹When preferred stock is missing, we replace it with the redemption value of preferred stock (Item 56).

B Industry Classifications

We employ two industry classifications. In the summary statistics, we group the 477 firms of our sample into six broad categories, summarized in the table below.

Industry	SIC codes
1. Technical	1000-1799 (mining, construction); 2800-2999 (chemicals, petroleum, coal); 3300-3699 (metal, machinery); 4900-4999 (electric, gas services); 8711 (engineering services)
2. Financial	6000-6799 (financial, insurance, and real estate industries) 8721 (accounting, auditing, and bookkeeping)
3. Manufacturing	2000-2799 (food, tobacco, textile, wood, printing); 3000-3299 (plastics, leather, glass); 3700-3999 (vehicles, miscellaneous)
4. Transportation	4100-4599, 4700-4799 (passenger transportation, freight transportation); 4600-4699, 4900-4999 (pipelines, energy distribution); 4800-4899 (communications)
5. Trade	5000-5199 (wholesale trade); 5200-5999 (retail trade)
6. Services	7000-8699 (hotels, repair, recreation, legal, educational, social); 8712-8713 (architectural, surveying); 8730-8999 (R&D, PR, miscellaneous)

In the regression analysis, we follow the industry definitions of Fama and French (1997). We group firms into 48 industries to distinguish between diversifying and within-industry mergers. The dummy variable “relatedness” is equal to one for mergers within a Fama-French industry group.

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Table 1a. Summary Statistics of Firm Data

All variables are defined in Appendices A and B. Number of firms = 320. Financial variables are reported in \$ millions. Assets, capital, and Q are at the beginning of the fiscal year; all other variables are at the end.

Variable	Observations	Mean	Median	Standard Deviation
Assets	3457	4,955.24	2,154.31	10,600.89
Capital	3457	2,163.96	928.20	3755.56
Investment	3378	356.68	153.14	740.65
Cash Flow	3457	422.63	190.73	833.78
Cash Flow normalized by lagged capital (CF/k)	3457	0.36	0.25	0.49
Cash Flow normalized by lagged assets (CF/a)	3457	0.11	0.10	0.08
Q	3457	1.45	1.14	0.92
Corporate Governance	3457	0.57	1	0.50
Technical Industry	3447	0.04	0	0.20
Manufacturing Industry	3447	0.50	1	0.50
Transportation Industry	3447	0.24	0	0.43
Trade Industry	3447	0.11	0	0.31
Financial Industry	3447	0.06	0	0.24
Service Industry	3447	0.05	0	0.21

Table 1b. Summary Statistics of CEO Data

All variables are defined in Appendices A and B. Number of CEOs = 663.

Variable	Observations	Mean	Median	Standard Deviation
Age	3456	57.49	58	6.80
Years as CEO	3434	8.59	6	7.46
President and Chairman	3457	0.39	0	0.49
Founder	2922	0.18	0	0.38
Ownership (%)	3457	2.29	0.12	7.01
Vested Options (#) (adjusted to 1994)	3440	181,367.00	39,355.00	755,241.60
Finance Education	1489	0.52	1	0.50

Table 1c. Summary Statistics of "Longholder" CEOs

This table includes only CEOs who at some point during their tenure held an option until expiration. All variables are defined in Appendices A and B. Number of CEOs = 106.

Variable	Observations	Mean	Median	Standard Deviation
Age	720	57.27	57.5	6.46
Years as CEO	698	10.31	9	7.02
President and Chairman	720	0.40	0	0.49
Founder	626	0.14	0	0.35
Ownership (%)	720	1.98	0.26	5.26
Vested Options (#) (adjusted to 1994)	710	472,370.00	147,750.00	1,548,720.00
Finance Education	329	0.57	1	0.50

Table 1d. Correlations

All variables are defined in Appendix A. Q, stock ownership, and vested options are at the beginning of the fiscal year. Number of observations = 3457.

	Longholder	Size	Q	CF/k	Stock Ownership	Vested Options	Corporate Governance
Longholder	1.00						
Size	-0.09	1.00					
Q	0.07	-0.34	1.00				
CF/k	0.09	-0.23	0.35	1.00			
Stock Ownership	-0.02	-0.18	0.12	0.14	1.00		
Vested Options	0.18	-0.18	0.09	0.15	0.09	1.00	
Corporate Governance	0.03	-0.37	0.13	0.12	0.20	0.08	1.00

Table 2. Summary Statistics of Completed Mergers

Relatedness is a dummy variable which takes the value 1 when the acquiror and target share a Fama-French industry group. Cumulative abnormal returns to the acquiror are calculated for an event window of -1 to +1 using a modified market model. The modified market model takes the daily S&P 500 return as the expected return in computing abnormal returns. Industry variables are defined in Appendix B. Merger financing is summarized in Table 3. The sample consists of 848 completed mergers.

Variable	Observations	Mean	Median	Standard Deviation
Relatedness	820	0.412	0	0.493
Cumulative abnormal return to acquiror [-1,+1]	848	-0.005	-0.005	0.044
Technical Industry	832	0.024	0	0.153
Acquiror in Manufacturing Industry	832	0.333	0	0.472
Acquiror in Transportation Industry	832	0.071	0	0.257
Acquiror in Trade Industry	832	0.078	0	0.269
Acquiror in Financial Industry	832	0.447	0	0.497
Acquiror in Service Industry	832	0.047	0	0.211

Table 3. Merger Financing: Summary Statistics

Year	Number of Mergers with Disclosed Method of Payment	Cash and Debt		Stock		Combination	
		Sample	US	Sample	US	Sample	US
1980	24	7	29%	10	42%	7	29%
1981	42	5	12%	21	50%	16	38%
1982	45	7	16%	22	49%	16	36%
1983	54	12	22%	22	41%	20	37%
1984	49	18	37%	13	27%	18	37%
1985	65	39	60%	14	22%	12	18%
1986	95	59	62%	24	25%	12	13%
1987	74	37	50%	26	35%	11	15%
1988	55	41	75%	9	16%	5	9%
1989	74	40	54%	23	31%	11	15%
1990	30	14	47%	12	40%	4	13%
1991	49	20	41%	21	43%	8	16%
1992	48	19	40%	20	42%	9	19%
1993	55	16	29%	31	56%	8	15%
1994	55	30	55%	15	27%	10	18%
Total	814	364	45%	283	35%	167	21%

Source: Mergerstat Review 1996 and 2002 and authors' calculations.

Table 4. Do Overconfident CEOs 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.

The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in columns 1-3 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Standard errors in column 4 are robust to heteroskedasticity and arbitrary within-industry correlation, where industries are measured using the 48 Fama and French industry groups (1997). Coefficients are presented as odds ratios.

	logit (1)	logit (2)	logit (3)	logit (4)	Random Effects logit (5)	Fixed Effects logit (6)
Size		0.8510 (2.71)***	0.8516 (2.26)**	0.8346 (1.84)*	0.8440 (2.27)**	0.5712 (3.10)***
Q _{t-1}		0.7936 (2.63)***	0.7968 (2.34)**	0.7134 (1.79)*	0.8068 (2.05)**	0.8353 (1.12)
Cash Flow		1.4949 (2.36)**	1.4536 (2.23)**	1.3760 (1.01)	1.4268 (2.84)***	1.4155 (1.43)
Stock Ownership		1.4177 (0.41)	1.6591 (0.61)	0.5621 (0.41)	1.5673 (0.42)	0.7388 (0.17)
Vested Options		1.4522 (2.18)**	1.4390 (1.88)*	1.6919 (0.56)	0.9477 (0.13)	0.2951 (2.29)**
Corporate Governance		0.6217 (3.56)***	0.6330 (3.30)***	0.5882 (2.60)***	0.6962 (2.33)**	1.0409 (0.20)
Longholder	1.6482 (2.89)***	1.5694 (2.64)***	1.5352 (2.50)**	1.5106 (2.12)**	1.7372 (3.19)***	2.6461 (2.69)***
Industry Fixed Effects	no	no	no	yes	no	no
Year Fixed Effects	no	no	yes	yes	yes	yes
Industry*Year Effects	no	no	no	yes	no	no
Observations	3457	3457	3457	2055	3457	2114
Number of Firms					320	180

Robust z statistics in parentheses. Constant included.

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

Table 5. Timing of Mergers and Inside Information

The sample consists only of CEOs for whom longholder=1. 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. 'x' Final Years of a Longheld Option is a binary variable where 1 signifies the last 'x' years of the duration of one of the longholder CEO's longheld options.

All regressions are logit with random effects. Coefficients are presented as odds ratios.

	(1)	(2)	(3)
Size	0.8883 (0.66)	0.8924 (0.64)	0.8919 (0.64)
Q _{t-1}	0.7185 (1.35)	0.7258 (1.31)	0.7247 (1.32)
Cash Flow	1.2959 (0.79)	1.3046 (0.81)	1.3021 (0.80)
Stock Ownership	0.0618 (0.72)	0.0639 (0.71)	0.0631 (0.71)
Vested Options	0.8428 (0.31)	0.8504 (0.29)	0.8514 (0.29)
Corporate Governance	0.9604 (0.11)	0.9611 (0.11)	0.9612 (0.11)
3 Final Years of a Longheld Option	0.8767 (0.48)		
4 Final Years of a Longheld Option		1.0648 (0.24)	
5 Final Years of a Longheld Option			1.0331 (0.12)
Year Fixed Effects	yes	yes	yes
Observations	719	719	719
Number of Firms	79	79	79

z statistics in parentheses. Constant included.

All firm years included. Variables as above. Remaining longholder CEO years are the years of a longholder CEO's tenure that do not fall in the 'x' final years of a longheld option. Regressions are logit with random effects. Coefficients are presented as odds ratios.

	(1)	(2)	(3)
Size	0.8436 (2.27)**	0.8441 (2.27)**	0.8441 (2.27)**
Q _{t-1}	0.8051 (2.07)**	0.8073 (2.04)**	0.8071 (2.05)**
Cash Flow	1.4263 (2.84)***	1.4276 (2.85)***	1.4273 (2.84)***
Stock Ownership	1.5636 (0.42)	1.5697 (0.43)	1.5687 (0.42)
Vested Options	0.9387 (0.15)	0.9502 (0.12)	0.9496 (0.13)
Corporate Governance	0.6963 (2.33)**	0.6961 (2.33)**	0.6962 (2.33)**
3 Final Years of a Longheld Option	1.5916 (1.99)**		
4 Final Years of a Longheld Option		1.7726 (2.70)***	
5 Final Years of a Longheld Option			1.7544 (2.80)***
Remaining Longholder CEO years	1.8307 (3.09)***	1.7043 (2.55)**	1.7140 (2.42)**
Year Fixed Effects	yes	yes	yes
Observations	3457	3457	3457
Number of Firms	320	320	320

z statistics in parentheses. Constant included.

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

Table 6. Are Overconfident CEOs Right to Hold their Options?Returns

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 a year sooner 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	0.04
70th	0.10
80th	0.19
90th	0.39
Mean	0.04
Standard Deviation	0.27

Do "Mistaken" Holders Drive the Acquisitiveness Result?

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. 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 column 1 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios. Longholders whose longheld options were not at least 40% in the money at the beginning of their final year are excluded.

	logit (1)	Random Effects logit (2)	Fixed Effects logit (3)
Size	0.8471 (2.30)**	0.8387 (2.27)**	0.5703 (2.99)***
Q _{t-1}	0.7924 (2.27)**	0.8038 (2.00)**	0.8748 (0.80)
Cash Flow	1.4647 (2.04)**	1.4392 (2.78)***	1.6066 (1.72)*
Stock Ownership	2.0954 (0.87)	1.9519 (0.61)	0.8058 (0.11)
Vested Options	2.2233 (0.98)	1.8178 (0.62)	0.7333 (0.22)
Corporate Governance	0.6053 (3.44)***	0.6619 (2.58)**	1.0221 (0.10)
Longholder: Did OK	1.1112 (0.44)	1.1339 (0.52)	1.0876 (0.15)
Longholder: Should Have Exercised	1.7357 (1.67)*	1.8857 (2.17)**	4.6484 (2.29)**
Year Fixed Effects	yes	yes	yes
Observations	3298	3298	1963
Number of Firms		312	167

Robust z statistics in parentheses. Constant included.

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

Table 7. Control for Returns

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. Returns are the natural logarithm of 1 plus the annual return on company equity. 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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in column 1 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

	logit (1)	Random Effects logit (2)	Fixed Effects logit (3)
Size	0.8860 (1.71)*	0.8725 (1.80)*	0.5154 (3.33)***
Q _{t-1}	0.7862 (2.09)**	0.8018 (1.82)*	0.8416 (0.96)
Cash Flow	1.2313 (1.14)	1.2447 (1.62)	1.2228 (0.76)
Stock Ownership	0.788 (0.26)	0.8122 (0.17)	0.5695 (0.23)
Vested Options	2.8778 (1.71)*	1.8944 (0.79)	0.3083 (0.95)
Corporate Governance	0.6357 (3.22)***	0.6914 (2.37)**	1.0251 (0.12)
Returns _{t-1}	1.5357 (1.76)*	1.505 (1.81)*	1.2796 (0.99)
Returns _{t-2}	1.3549 (1.61)	1.3118 (1.30)	1.1122 (0.47)
Returns _{t-3}	1.0842 (0.40)	1.0586 (0.27)	0.9745 (0.12)
Returns _{t-4}	1.264 (1.08)	1.2598 (1.07)	1.1912 (0.78)
Returns _{t-5}	1.3345 (1.38)	1.3179 (1.33)	1.2239 (0.93)
Longholder	1.4694 (2.24)**	1.6211 (2.77)***	2.5817 (2.59)***
Year Fixed Effects	yes	yes	yes
Observations	3314	3314	2045
Number of Firms		304	174

Robust z statistics in parentheses. Constant included.

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

Table 8. Control for Return Volatility

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. Volatility is the natural logarithm of 1 plus the variance of returns on company equity. 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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in column 1 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

	logit (1)	Random Effects logit (2)	Fixed Effects logit (3)
Size	0.8821 (1.75)*	0.875 (1.79)*	0.5933 (2.84)***
Q _{t-1}	0.8063 (2.26)**	0.8194 (1.92)*	0.8686 (0.88)
Cash Flow	1.4086 (2.16)**	1.4077 (2.80)***	1.4436 (1.49)
Stock Ownership	0.899 (0.12)	0.9026 (0.09)	0.6364 (0.25)
Vested Options	1.3888 (1.93)*	0.9612 (0.10)	0.306 (2.21)**
Corporate Governance	0.6438 (3.17)***	0.7002 (2.31)**	1.0428 (0.20)
Volatility _{t-1}	1.2672 (3.22)***	1.2413 (2.42)**	1.0403 (0.34)
Longholder	1.4784 (2.26)**	1.6777 (3.02)***	2.637 (2.69)***
Year Fixed Effects	yes	yes	yes
Observations	3432	3432	2102
Number of Firms		319	180

Robust z statistics in parentheses. Constant included.

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

Table 9. Control for Finance Education

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. Finance education is an indicator where 1 signifies that the CEO has an MBA, Ph.D. in economics or finance, or undergraduate training in finance. 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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in column 1 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

	logit (1)	Random Effects logit (2)	Fixed Effects logit (3)
Size	0.7624 (2.27)**	0.7536 (2.49)**	0.1998 (3.96)***
Q _{t-1}	0.8624 (1.24)	0.8514 (1.01)	0.6985 (1.32)
Cash Flow	1.0686 (0.24)	1.0389 (0.14)	0.9442 (0.13)
Stock Ownership	1.0163 (0.01)	0.8967 (0.06)	18.3462 (0.31)
Vested Options	1.2847 (0.28)	1.3302 (0.22)	3.7916 (0.73)
Corporate Governance	0.5132 (3.01)***	0.5515 (2.51)**	1.2581 (0.72)
Finance education	1.55 (2.00)**	1.6434 (2.17)**	3.2946 (1.46)
Longholder	1.7248 (2.29)**	1.8757 (2.42)**	5.6952 (1.51)
Year Fixed Effects	yes	yes	yes
Observations	1489	1489	819
Number of Firms		188	83

Robust z statistics in parentheses. Constant included.

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

Figure 10. Overconfidence and Completed Mergers for Different % in the Money

Percentage in the money calculated at the beginning of the last year of duration. To keep the same comparison group across regressions (and limit attenuation for high % in the money), we omit observations where a CEO goes from overconfident to not overconfident as we increase the required % in the money to be overconfident. Regressions are specified as in Columns 3, 5, and 6 of Table 4.

% in money	logit			Random Effects logit			Fixed Effects logit		
	observations	odds ratio	p-value	observations	odds ratio	p-value	observations	odds ratio	p-value
0	3375	1.46	0.04	3375	1.63	0.01	2034	2.33	0.02
10	3375	1.46	0.04	3375	1.63	0.01	2034	2.33	0.02
20	3365	1.44	0.06	3365	1.58	0.01	2024	2.33	0.03
30	3345	1.33	0.15	3345	1.43	0.06	1998	2.11	0.07
40	3332	1.37	0.12	3332	1.47	0.04	1991	2.12	0.06
50	3324	1.33	0.17	3315	1.43	0.07	1983	2.11	0.06
60	3318	1.34	0.15	3318	1.46	0.05	1977	2.37	0.04
70	3301	1.36	0.13	3301	1.50	0.04	1966	2.98	0.02
80	3301	1.36	0.13	3301	1.50	0.04	1966	2.98	0.02
90	3299	1.37	0.13	3299	1.51	0.04	1964	3.14	0.02
100	3276	1.41	0.10	3276	1.56	0.03	1950	3.16	0.02

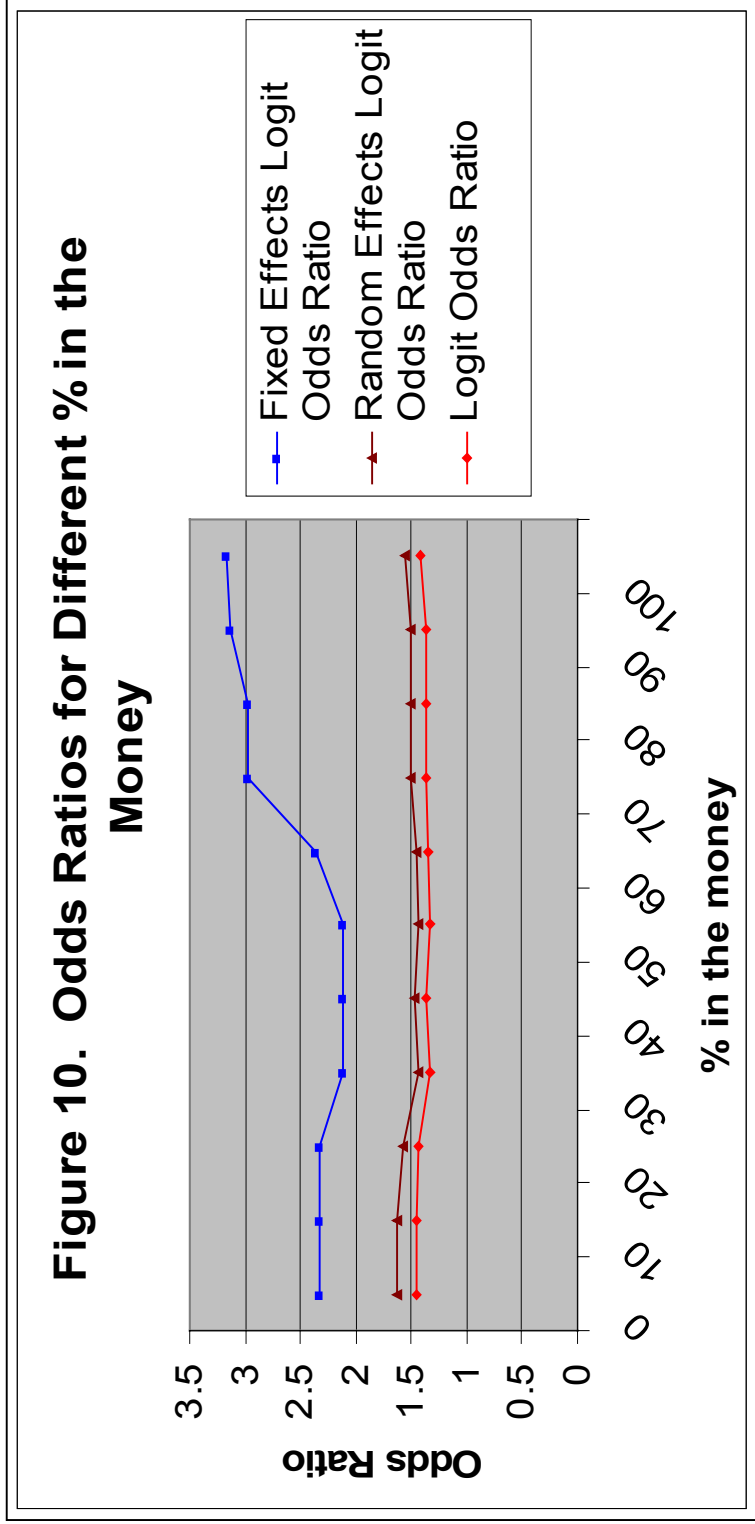


Table 11. Robustness (I): Always a Holder versus Never a Holder

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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in columns 1-3 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Standard errors in column 4 are robust to heteroskedasticity and arbitrary within-industry correlation, where industries are measured using the 48 Fama and French industry groups (1997). Coefficients are presented as odds ratios.

Sample is restricted to CEOs who always held some portion of their option packages until the final year before expiration and CEOs who never held any portion of an option package until its final year.

	logit (1)	logit (2)	logit (3)	logit (4)	Random Effects logit (5)	Fixed Effects logit (6)
Size		0.8410 (2.76)***	0.8437 (2.31)**	0.8342 (1.58)	0.8365 (2.25)**	0.5379 (3.13)***
Q _{t-1}		0.8171 (2.02)**	0.8213 (1.78)*	0.7596 (1.10)	0.8309 (1.66)*	0.9070 (0.52)
Cash Flow		1.4326 (1.84)*	1.3858 (1.68)*	1.1866 (0.45)	1.3554 (2.33)**	1.3965 (1.22)
Stock Ownership		1.6624 (0.60)	1.9734 (0.82)	0.4609 (0.48)	1.8467 (0.59)	1.1317 (0.07)
Vested Options		1.3688 (1.98)**	1.3470 (1.67)*	1.4492 (0.45)	0.9510 (0.12)	0.2400 (2.34)**
Corporate Governance		0.6369 (3.17)***	0.6519 (2.90)***	0.6946 (1.54)	0.7074 (2.10)**	1.0419 (0.19)
Longholder	1.9872 (2.85)***	1.7834 (2.40)**	1.7824 (2.37)**	1.9823 (1.99)**	1.9810 (2.81)***	2.5239 (1.91)*
Industry Fixed Effects	no	no	no	yes	no	no
Year Fixed Effects	no	no	yes	yes	yes	yes
Industry*Year Effects	no	no	no	yes	no	no
Observations	2981	2981	2981	1677	2981	1791
Number of Firms					297	155

Robust z statistics in parentheses. Constant included.

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

Table 12. Robustness (II): Always a Holder versus Early Exercisers

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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in columns 1-3 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Standard errors in column 4 are robust to heteroskedasticity and arbitrary within-industry correlation, where industries are measured using the 48 Fama and French industry groups (1997). Coefficients are presented as odds ratios.

Sample is restricted to CEOs who always held some portion of their option packages until the final year before expiration and CEOs who always exercised option packages, in their entirety, faster than average (i.e. when the package still had 6 or more remaining years duration).

	logit (1)	logit (2)	logit (3)	logit (4)	Random Effects logit (5)	Fixed Effects logit (6)
Size		0.8872 (1.37)	0.9157 (0.89)	0.9362 (0.50)	0.9107 (0.89)	0.2438 (3.03)***
Q _{t-1}		0.9417 (0.36)	1.0108 (0.06)	1.0720 (0.23)	1.0417 (0.25)	1.3542 (1.00)
Cash Flow		0.9634 (0.18)	0.8909 (0.53)	0.4781 (1.33)	0.8843 (0.46)	0.6652 (0.66)
Stock Ownership		0.3207 (0.52)	0.4041 (0.41)	0.6280 (0.15)	0.3772 (0.42)	0.0030 (0.95)
Vested Options		1.6308 (2.75)***	1.6486 (2.64)***	8,113.42 (3.13)***	1.4082 (0.76)	0.2001 (1.94)*
Corporate Governance		0.8120 (1.11)	0.8641 (0.77)	0.7119 (1.04)	0.8956 (0.49)	1.6392 (1.47)
Longholder	1.6950 (2.11)**	1.6769 (2.06)**	1.7259 (2.10)**	1.7210 (1.50)	1.7577 (2.38)**	3.0197 (1.36)
Industry Fixed Effects	no	no	no	yes	no	no
Year Fixed Effects	no	no	yes	yes	yes	yes
Industry*Year Effects	no	no	no	yes	no	no
Observations	1184	1184	1184	473	1184	713
Number of Firms					151	80

Robust z statistics in parentheses. Constant included.

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

Table 13. The Effect of Title-Accumulation, Age, and Tenure on Acquisitiveness

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. Boss is a binary variable where 1 signifies that the CEO is also president and chairman of the board. 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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in columns 1, 4, and 7 are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

	Random			Fixed Effects			Random			Fixed Effects		
	logit (1)	Effects logit (2)	logit (3)	logit (4)	Effects logit (5)	logit (6)	logit (7)	Effects logit (8)	logit (9)			
Size	0.8523 (2.25)**	0.8441 (2.27)**	0.5666 (3.13)***	0.8527 (2.27)**	0.8462 (2.23)**	0.5744 (3.04)***	0.8535 (2.26)**	0.8464 (2.22)**	0.5695 (3.08)***			
Q _{t-1}	0.7962 (2.34)**	0.8067 (2.05)**	0.8363 (1.11)	0.8015 (2.35)**	0.8051 (2.08)**	0.8158 (1.22)	0.8004 (2.35)**	0.8046 (2.08)**	0.8161 (1.22)			
Cash Flow	1.4532 (2.23)**	1.4268 (2.84)***	1.4238 (1.45)	1.4263 (2.20)**	1.4165 (2.79)***	1.4506 (1.50)	1.4255 (2.20)**	1.4164 (2.79)***	1.4603 (1.53)			
Stock Ownership	1.6604 (0.61)	1.5698 (0.43)	0.7402 (0.17)	2.2371 (0.98)	1.9942 (0.65)	0.7349 (0.17)	2.2365 (0.98)	1.9994 (0.65)	0.7337 (0.18)			
Vested Options	1.4449 (1.87)*	0.9483 (0.13)	0.2913 (2.30)**	1.4116 (1.63)	0.9382 (0.15)	0.2939 (2.27)**	1.4181 (1.63)	0.9393 (0.15)	0.2897 (2.28)**			
Corporate Governance	0.6345 (3.27)***	0.6966 (2.32)**	1.0444 (0.21)	0.6324 (3.30)***	0.6934 (2.35)**	1.0432 (0.21)	0.6344 (3.27)***	0.6942 (2.34)**	1.0467 (0.22)			
Boss	0.9637 (0.30)	0.9895 (0.08)	0.9245 (0.48)				0.9536 (0.38)	0.9773 (0.17)	0.9222 (0.49)			
Age				0.9884 (1.11)	0.9877 (1.08)	0.9855 (0.78)	0.9883 (1.12)	0.9877 (1.09)	0.9848 (0.81)			
Tenure				0.9933 (0.64)	0.9925 (0.67)	1.0055 (0.29)	0.9933 (0.63)	0.9925 (0.67)	1.0058 (0.30)			
Longholder	1.5358 (2.50)**	1.7376 (3.19)***	2.6614 (2.71)***	1.5891 (2.67)***	1.7902 (3.32)***	2.5184 (2.50)**	1.5904 (2.67)***	1.7911 (3.33)***	2.5272 (2.51)**			
Year Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes			
Observations	3457	3457	2114	3433	3433	2101	3433	3433	2101			
Number of Firms		320	180		319	179		319	179			

Robust z statistics in parentheses. Constant included.

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

Table 14. 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. The fixed effects logit model is estimated consistently using a conditional logit specification. Standard errors in columns 1 and 4 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)
Size	0.9885 (0.14)	0.9832 (0.18)	0.6947 (1.52)	0.701 (3.53)***	0.6836 (3.37)***	0.4389 (3.21)***
Q _{t-1}	0.8549 (1.27)	0.8648 (1.03)	0.8867 (0.53)	0.7382 (2.30)**	0.7488 (1.92)*	0.739 (1.24)
Cash Flow	1.0715 (0.41)	1.0856 (0.45)	1.137 (0.44)	1.7172 (3.10)***	1.6964 (3.33)***	2.2341 (2.06)**
Stock Ownership	3.1848 (1.08)	2.7416 (0.73)	0.3146 (0.44)	1.1362 (0.10)	1.0694 (0.04)	1.4972 (0.17)
Vested Options	1.7526 (3.84)**	1.2739 (0.53)	0.5655 (1.05)	0.813 (0.77)	0.5391 (1.03)	0.167 (1.78)*
Corporate Governance	0.5262 (3.46)**	0.5592 (2.92)***	0.8388 (0.66)	0.8177 (0.97)	0.9271 (0.33)	1.3381 (0.99)
Longholder	1.647 (2.54)**	1.9132 (2.95)***	3.6071 (2.66)***	1.3596 (1.26)	1.4812 (1.53)	1.4791 (0.71)
Year Fixed Effects	yes	yes	yes	yes	yes	yes
Observations	3457	3457	1427	3457	3457	1143
Number of Firms		320	122		320	96

Robust z statistics in parentheses. Constant included.

* significant at 10%, ** significant at 5%, *** significant at 1%

Table 16. Merger Financing and Overconfidence**All Mergers with Disclosed Method of Payment**

	Cash and Debt	Stock	Comb.	odds (cash v. stock)	odds (cash v. other)	odds ratio (v stock)	odds ratio (v other)
Overconfident CEOs	47%	35%	17%	1.33	0.89	1.05	1.14
Non-overconfident CEOs	44%	35%	22%	1.27	0.78		

Mergers where Target Value is at Least 25% of Acquiror Value

	Cash and Debt	Stock	Comb.	odds (cash v. stock)	odds (cash v. other)	odds ratio (v stock)	odds ratio (v other)
Overconfident CEOs	44%	40%	16%	1.10	0.78	1.09	1.41
Non-overconfident CEOs	36%	35%	29%	1.01	0.55		

Regressions

Sample includes all merger bids that were eventually successful. The dependent variable is binary where 1 signifies that the bid was financed using only cash and debt. Undervalued is a binary variable where 1 indicates that Q at the beginning of the year was less than or equal to 1. 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). 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. UV * Longholder is the interaction of those two variables. Standard errors are robust to heteroskedasticity and arbitrary within-firm serial correlation. Coefficients are presented as odds ratios.

	logit (1)	logit (2)	logit (3)	logit (4)
Undervalued (UV)	1.1092 (0.36)	0.678 (1.23)	0.6481 (1.39)	1.0398 (0.11)
Q _{t-1}		0.4913 (3.39)***	0.4996 (3.31)***	0.4921 (3.41)***
Stock Ownership			1.0822 (0.05)	0.6959 (0.17)
Vested Options			0.6741 (0.98)	0.5780 (1.38)
Merger Size			1.0016 (1.37)	1.0018 (1.11)
Longholder	0.7059 (1.36)	0.7262 (1.30)	0.7502 (1.15)	0.7235 (1.23)
UV * Longholder	4.8939 (2.70)***	4.8148 (2.67)***	4.9678 (2.73)***	2.7755 (1.68)*
Year Fixed Effects	no	no	no	yes
Observations	372	372	372	372

Robust z statistics in parentheses. Constant included.

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

Table 17. How Does the Market Respond to Overconfident CEOs' Mergers?

The event window is the day before through the day after the announcement of the (eventually successful) bid. The dependent variable is the cumulative abnormal return on the bidder's stock from the day before the announcement of the bid through the day after. 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. 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. High vested options is 0 for the lower 99% of the distribution of vested options and vested options for the upper tail. Low vested options is the reverse. Relatedness is 1 for acquisitions in which the bidder and target firms are in the same industry. Industries are the 48 Fama and French industry groups (1997). Cash financing is a binary variable where 1 indicates that the acquisition was financed using some combination of cash and debt. Boss is a binary variable where 1 signifies that the CEO is also the president and chairman of the board. 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. Standard errors in columns 1-3 and 5 are robust to heteroskedasticity and arbitrary within-firm correlation. Standard errors in column 4 are robust to heteroskedasticity and arbitrary within-industry correlation, where industries are measured using the 48 Fama and French industry groups (1997).

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)
Stock Ownership	0.0451 (1.23)	0.0282 (0.65)	0.029 (0.63)	0.1053 (1.43)	0.0212 (0.45)
High Vested Options	0.0057 (0.16)	0.0056 (0.18)	0.009 (0.29)	-0.0238 (0.49)	0.012 (0.36)
Low Vested Options	1.3426 (2.54)**	1.2881 (2.42)**	1.3263 (2.44)**	-0.7628 (1.37)	1.3754 (2.49)**
Relatedness		0.0057 (1.61)	0.0057 (1.62)	0.0084 (1.21)	0.0053 (1.50)
Corporate Governance		0.0062 (1.69)*	0.0072 (1.97)*	0.0036 (0.60)	0.0065 (1.77)*
Cash Financing		0.0118 (3.48)***	0.0131 (3.57)***	0.0092 (2.24)**	0.0136 (3.65)***
Age					-0.0004 -1.33
Boss					0.00 -0.4
Longholder	-0.0078 (2.23)**	-0.0074 (1.99)**	-0.0073 (1.92)*	-0.0072 (2.27)**	-0.0081 (2.05)**
Industry Fixed Effects	no	no	no	yes	no
Year Fixed Effects	no	no	yes	yes	yes
Industry*Year Effects	no	no	no	yes	no
Observations	741	673	673	673	673
R-squared	0.02	0.06	0.09	0.56	0.09

Absolute value of t statistics in parentheses. Constant included.

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